Labour Market Policy Directorate
Strategic Policy and Planning

An Index of the Employment Opportunities for New Immigrants, Based on Skills Transferability and Occupational Barriers

Final Report

by:
Bill Ahamad, Margaret Roberts,
Jo-Ann Sobkow and Dan Boothby

January 2003

Human Resources and Skills Development Canada
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This paper is available in French under the title *Indice des possibilités d'emploi des nouveaux immigrants reposant sur la transférabilité des compétences et les obstacles qui entravent l'accès aux professions.*
La version française du présent document est disponible sous le titre *Indice des possibilités d'emploi des nouveaux immigrants reposant sur la transférabilité des compétences et les obstacles qui entravent l'accès aux professions.*

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Executive Summary

Overview

This paper provides a report on a study to develop a quantitative model for examining the effects of various factors on the potential employment opportunities for new immigrants in different occupations. These factors include:

- The skills transferability to other occupations;
- Barriers that affect entry into each occupation;
- Wages in each occupation;
- Job prospects in each occupation; and
- The level of employment in each occupation.

Skills transferability

The concept of skills and knowledge (or occupational) transferability is a key element in the Model. Some individuals possess the skills and knowledge (or skills for short) that allow them to perform only a limited number of tasks; the jobs open to them are therefore limited, and so too are the occupations in which they are able to work. Other individuals possess the skills and knowledge that allow them to perform a range of tasks; many jobs are open to them, and they are sometimes capable of working in a range of occupations.

The elements in the skills transferability matrix reflect the extent to which the same skills are required in two occupations: they therefore show the potential for the use of these skills in the two occupations (that is, the potential for skills transferability). The matrix element for an occupation is assigned a value of 1 if the potential for skills transferability to another occupation is 'high'; it is assigned a value of 0 if the potential for skills transferability to another occupation is 'low'. 'High' and 'low' are determined by subjective assessment of the information available for occupations.

Occupational barriers

Occupational barriers form an important component in the Model: although the coefficients of skills transferability may indicate that the same skills are required in two occupations, entry to one of these occupations may be prevented or restricted because of an occupational barrier. Thus new immigrants may not be able to immediately enter the occupations for which they were educated and trained outside Canada.

Occupational barriers can be formal or informal. Formal (or institutional) barriers are regulations (certification, licensing, or membership in an association) that govern entry to occupations. We identified formal occupational barriers for each jurisdiction in Canada on the basis of the documentation available.

Entry to some occupations can also be affected by factors such as lack of recognition of education and training obtained outside Canada, and the difficulty some new immigrants face in getting the work experience required to satisfy the requirements for a certificate or licence in Canada. Such factors restrict employment in some occupations, so that they can be treated as occupational barriers: we refer to them as informal occupational barriers. Informal barriers are not often specified or documented, and hence they cannot easily be identified. We used 1996 census data on the occupations of immigrants and non-immigrants as a basis for identifying informal barriers.

The effectiveness of a barrier varies by occupation. Some barriers (such as those instituted for health and safety reasons) are regulated by law and hence are highly effective. Others are only partially effective (for example, if they are voluntary); and some occupations have no barriers at all, or the barrier is not effective. We used three values for occupational barriers in the Model: 0 (for a highly effective barrier); 0.5 (for a partially effective barrier); and 1 (for an ineffective [no] barrier).

Job prospects, wages and employment level

Data on job prospects were obtained from the 2000 *Job Futures* Website: they are therefore based on the outlook for each occupation developed by HRDC. Data on the wages and on the employment level in each occupation were obtained from the 1996 census.

Findings

Experiments with the Model show that skills transferability and occupational barriers are the most important of the five factors in the Model. The effects of earnings, job prospects, and the level of employment are also important; but they depend, to some extent, on the skills transferability and occupational barriers in the occupation.

We identified four categories of occupations that are helpful in demonstrating the use of the Model for developing government policy, and for providing advice for new immigrants.

- *Occupations with highly effective barriers and low skills transferability to other occupations*

  Occupations in this category include: 'Air Traffic Control Occupations', 'Occupational Therapists', 'Lawyers and Quebec Notaries', 'Electricians (except Industrial and Power System)', and 'Plumbers'.

  Since the barriers in these occupations are highly effective, most new immigrants in such occupations (who were educated or trained in a foreign country) would not be able to enter the occupation on immigrating to Canada. Moreover, they would not be able to use their skills and knowledge in any other occupation in the Model. This suggests that they would probably be well advised not to consider immigrating to Canada unless they were willing to undertake a retraining program, or to work in an occupation requiring lower skills and knowledge than they possess. It would also seem

reasonable that individuals qualified in these occupations (and educated in a foreign country) should be given a low priority in the immigration selection process.

- *Occupations with highly effective barriers and high skills transferability to other occupations*

  Occupations in this category include: 'General Practitioners and Family Physicians', 'Pharmacists', 'Registered Nurses', and 'Psychologists'.

  Since the barriers in these occupations are highly effective (like those in the previous category), most new immigrants (educated or trained in a foreign country) would not be able to enter such occupations on immigrating to Canada. However, since there is a high degree of skills transferability for these occupations, they may be able to use their skills and knowledge in other occupations in the Model. Thus, they may be encouraged to immigrate to Canada if they were willing to work in occupations other than the one in which they were trained. It would also seem reasonable that individuals qualified in these occupations (and educated in a foreign country) should be given a higher priority in the immigration selection process than those in the previous category.

- *Occupations with no barriers or with partly effective barriers and low skills transferability to other occupations*

  Occupations in this category include: 'Secretaries (except Legal and Medical)', 'Medical Laboratory Technicians', 'Education Policy Researchers, Consultants and Program Officers', and 'Tool and Die Makers'.

  Since there are no barriers in these occupations or the barriers are only partially effective, some new immigrants (educated or trained in a foreign country) would be able to enter the occupation on immigrating to Canada. At the same time, because of the low degree of skills transferability in these occupations, new immigrants would not be able to use their skills and knowledge in other occupations in the Model. It follows that new immigrants in occupations in this category would be well advised to pay close attention to economic factors (wages, job prospects and total employment) affecting the relative demand for the occupation in Canada. It would also make sense that economic factors affecting the relative demand for the occupation in Canada be considered in setting their priority in the immigration selection process.

- *Occupations with no barriers or with partly effective barriers and high skills transferability to other occupations*

  Occupations in this category include: 'Financial Auditors and Accountants', 'Computer Engineers', 'Electrical and Electronics Engineering Technologists and Technicians', 'Social Workers', and 'Journalists'.

  Since there are no barriers in these occupations or the barriers are only partially effective, some new immigrants (educated or trained in a foreign country) would be able to enter the occupation on immigrating to Canada. Moreover, since there is a high degree of skills transferability in these occupations, new immigrants would be able to use their skills and knowledge in other occupations in the Model. It follows that new immigrants in occupations in this category are likely to have employment opportunities

in occupations other than the one in which they were educated or trained: thus, it would be make sense for them to consider economic conditions (wages, job prospects and total employment) in these other occupations (as well as in the occupation in which they were trained) in making their decisions to immigrate. And it would also seem reasonable that they should be given a high priority in the immigration selection process.

Suggestions for future work

Several suggestions are made for future work:

- *Increasing the number of occupations in the Model*

The Model described in this Report includes 200 occupations in Skill Level A and Skill Level B in the NOC. Some attempt should be made to develop a method for including Management occupations and occupations in Skill Level C and Skill Level D: these occupations were excluded in the Model described here.

- *Modifying the values of the parameters in the Model*

The Model described in this Report is based on particular values of the parameters (i.e. wages, job prospects and total employment). It would be fairly straightforward to modify the Model using, say, data on wages from the 2001 Census, and to use different measures for the other parameters in the Model. Another useful modification would be to introduce some variation in the coefficients of skills transferability and in the index for occupational barriers.

- *Applying the Model for different provinces and territories*

The Model described in this Report is national and takes no account of jurisdictional differences. However, it would be make sense to develop a model for each jurisdiction (this implies developing 13 different models). The Model can also be modified to study the effects of barriers in different provinces and territories on the occupational opportunities of workers in the labour force.

- *Using the Model for exploring supply adjustments by occupation*

The Model described in this Report has been developed for new immigrants: it therefore *includes* barriers for entry to the same occupation. However, the Model can be modified for use in identifying new employment opportunities for those already working in Canada. In this case, the Model would *exclude* barriers for entry to the same occupation (except in cases in which inter-jurisdictional barriers exist). With this modification, the Model could be used to provide information on occupational choice for workers in the Canadian workforce.

- *Using the Model for examining employment opportunities for new graduates*

The Model can also be adapted to provide information on the occupational choices of new graduates in Canada. This would require the development of an additional model for

identifying the occupational choices of new graduates in different fields of study (and hence with particular skills and knowledge). Such a modification would be useful as a basis for providing counselling and career guidance for new graduates; and it would be useful as an analytical tool for studying changes in the supply of new graduates on the potential supply of labour by occupation.

1. Introduction

Over recent years, a variety of factors, such as increasing globalization and the effects of rapidly changing technology, have generated considerable interest in the development of the knowledge, skills, abilities and competencies of workers. These form the essential components of the human capital of an economy and are therefore critical in economic growth and development.

The relationship between the occupations and the skills and knowledge of workers provides important information on the human capital in an economy. An occupation is a collection of jobs that are similar in terms of the type of work performed; the skills and knowledge of workers are necessary for efficiently carrying out the tasks in jobs, and hence for working in different occupations. Thus occupations implicitly include important information about the skills and knowledge of workers.

As technology develops, the skills and knowledge (or skills for short) required for performing the tasks in different occupations tend to change, and so does the demand for occupations. Workers react by changing jobs and occupations. However, workers in a given occupation would generally only be able to change occupations if their skills were transferable to other occupations: thus the potential employment opportunities for workers in different occupations (and hence labour market flexibility) will depend on the skills transferability between occupations. Other factors are likely to be important as well. These include: occupational barriers that restrict employment in some occupations; occupational wages; job prospects; the level of occupational employment; and other such factors.

This paper reports on a study to develop a quantitative model for examining the effects of factors such as the above on the potential employment opportunities for new immigrants in different occupations. The Model provides a basis for deriving an index for each occupation on the basis of:

- The skills transferability to other occupations;
- Barriers that affect entry into each occupation;
- Earnings in each occupation;
- Job prospects in each occupation; and
- The level of employment in each occupation.

The Model is used in this Report to derive an index of the potential employment opportunities for new immigrants to Canada. But it can be used (with some modification) for other policy and research applications. For example, it can be used to explore the potential employment opportunities for new graduates, and hence as a basis for providing them with counselling and career guidance; or it can be used in an exploratory way to study potential changes in the occupational supply in the economy.

An index of the potential employment opportunities of immigrants may have important implications for human resource policy in Canada. Immigration provides a significant part of the new supply of labour for the Canadian economy. For example, about 174,000 immigrants entered Canada in 1998; and about 190,000 entered in 1999. Individuals who apply for entry to Canada as independent immigrants are awarded points for factors such as age, occupation, education/training, arranged employment, work experience, language ability and personal suitability. These points are used as a basis for granting immigration status. Thus the point system provides a basis for ensuring that the flow of immigrants is consistent with labour market demands in Canada.

The point system has been in use since 1967, but it has been criticized because it '...focuses on achieving targets for precise occupational niches rather than looking for the flexible and transferable skills needed in a fluid and rapidly changing society and economy', (see *Building on a Strong Foundation for the 21st Century: New Directions for Immigration and Refugee Policy and Legislation*, Citizenship and Immigration Canada, 1998).

The Model developed in this Report provides an alternative to the point system. It is based on the skills and knowledge transferability to other occupations, so that it includes the effects of flexible and transferable skills. It also incorporates the effects of occupational barriers that may prevent new immigrants from finding employment in some occupations. Finally, it includes the effects of some economic factors in Canada. It follows that the Model may be particularly useful as a tool for the selection of immigrants.

The next chapter of this Report provides a broad overview of the Model and of the measurement of the factors that affect the index derived for each occupation (which we refer to as the Derived Index). The mathematical specification of the Model is included in Appendix I.

Chapter III broadly describes the procedure used to develop the skills transferability coefficients for occupations, as well as the data sources used; it also includes a description of the rationale used for selection of the occupations included in the Model. Appendix IV includes the skills transferability coefficients for the different occupations included in the Model.

Chapter IV describes the development of indices of occupational barriers. The analysis includes the identification of formal or institutional barriers (based on the available documentation). We also tried to identify informal occupational barriers (which are not documented) using empirical analysis. Appendix V provides a summary table of the formal occupational barriers we identified; and Appendix VI shows the informal occupational barriers we derived using empirical analysis. In Appendix VII, we compare the formal and informal occupational barriers we identified.

Chapter V provides a discussion of the Derived Index for selected occupations: the Derived Index for all occupations in the Model is included in Appendix II. The values of the Derived Index for different experiments (no skills transferability; no occupational barriers; the same wages in each occupation; good job prospects in all occupations; and the same employment in each occupation) are compared Appendix III.

Our conclusions and suggestions for future work are presented in Chapter VI.

The values of the parameters for each occupation in the Model are included in the appendices: the skills transferability coefficients in Appendix IV; the formal occupational barriers in Appendix V; the informal occupational barriers in Appendix VI; and the indices of wages, job prospects and employment in Appendix VIII.

Three detailed reports were prepared for this Study:

- *Matrix of Skills Transferability*, prepared by Margaret Roberts.
- *Report On Formal Occupational Barriers*, prepared by Jo-Ann Sobkow.
- *Identification of Barriers to Occupational Entry: Quantitative Methods Using Census Data*, by Daniel Boothby.

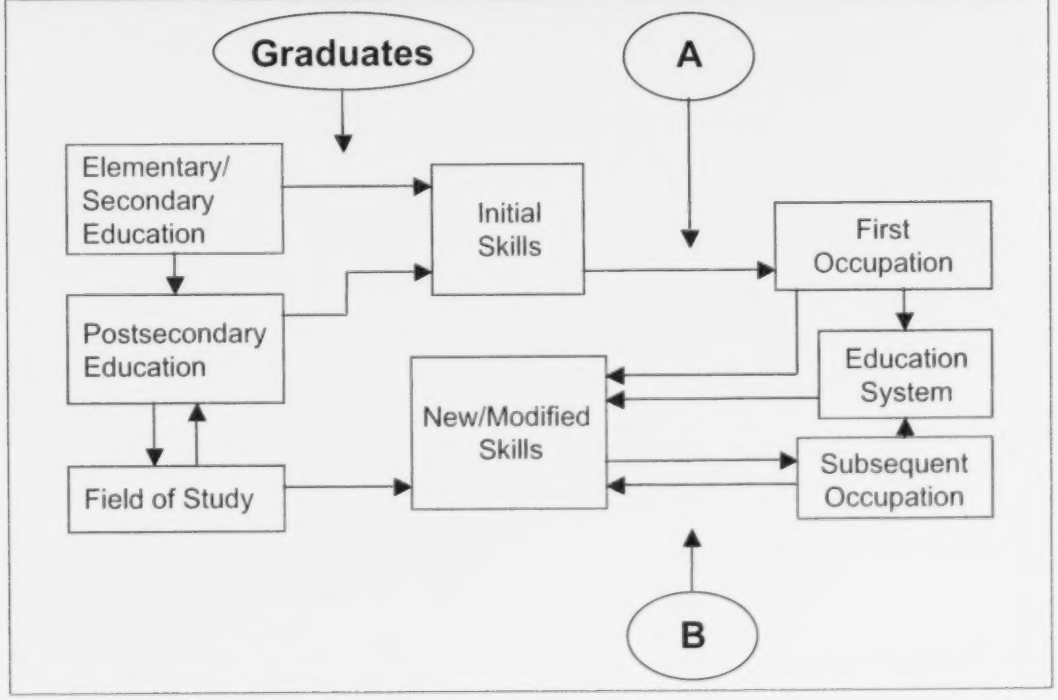
These are available separately from the Applied Research Branch, Human Resources Development Canada (HRDC).

2. Overview of the Model

2.1 Approach

Chart II.1 shows a schematic diagram of the relationship between the levels of education, the fields of study, the occupations and the skills of workers. Individuals initially develop skills (and knowledge) through elementary/secondary education (as well as through other activities): some graduates continue to postsecondary education, while others directly enter the labour market. Those in the postsecondary education system develop additional skills through postsecondary learning; those in the labour market develop new or modified skills through work experience in the occupations in which they work, and through continuing education and training. These new/modified skills provide opportunities for employment in additional occupations. Individuals make occupational choices at points such as at A (for their first occupation) and at B (for a subsequent occupation).

Chart II.1
Schematic diagram of the relationship between levels of education, fields of study, skills and occupations



This schematic diagram is helpful in trying to construct a model for exploring the employment opportunities of workers. The standard approach in economics assumes that employment and wages in an occupation are determined through the interaction of the demand and supply of workers capable of working in that occupation (and hence with

the required skills and knowledge). If relative wages were to rise in a given occupation, workers would be encouraged to move to that occupation; but only workers capable of working in that occupation (i.e. with skills and knowledge that are transferable to that occupation), would be able to do so. Thus an economic model for determining the employment level in different occupations would need to take account of factors such as the demand and supply in different occupations (and hence the skills and knowledge possessed by individuals in those occupations), the substitution possibilities between occupations, the barriers that prevent or restrict employment in various occupations, relative wages and so on.

Such a model would require a considerable amount of data, particularly if occupations were classified at a detailed level; in addition, the model would be extremely complex, and it may not be possible to satisfactorily resolve some of the more technical issues. But it may nevertheless be possible to develop a model that takes broad account of some of the important factors, and that can still be used for policy development. This Report makes an attempt to do so.

2.2 Factors included in the Model

The Model described in this Report is based on five factors that are likely to affect the potential employment opportunities (and hence the potential supply) of workers in different occupations:

- Skills transferability to other occupations;
- Barriers that restrict entry to some occupations;
- Earnings in different occupations;
- Job prospects in different occupations;
- The level of employment in different occupations.

The rationale for including each of these factors in the Model is discussed below.

2.2.1 Skills transferability to other occupations

In developing the Model, we assume that individuals generally require a unique set of skills and knowledge to efficiently perform the tasks in a given occupation. Employers are not likely to offer employment to individuals who do not possess (as a minimum) the required skills and knowledge; at the same time, individuals are not likely to accept jobs in occupations in which they cannot use their unique skills and knowledge. In practice there is likely to be some mismatch between the skills required in jobs, and the skills possessed by workers (for example, because of incomplete labour market information). Thus the occupations of individuals only provide a rough indicator of the skills and knowledge they possess.

Information on the skills and knowledge required for different occupations is not currently available, so that the potential employment opportunities for workers in a given occupation cannot be identified directly. However, the information available on occupations (such as that in the National Occupational Classification) shows that different occupations are sometimes similar in terms of the factors required for employment (such as education, training, work responsibilities, employer requirements, and other such factors). The similarity of the factors required for employment in different occupations implies that the skills and knowledge required for employment in those occupations are also similar.

The similarity between the skills and knowledge required for employment in different occupations is one of the central components of the Model described in this Report. We assume that the similarity between the factors required for employment in two occupations implies that workers in one of the two occupations would be able to meet the requirements for employment in the other. Thus individuals working in occupations with skills and knowledge that are required (or transferable) to many other occupations are likely to have a range of potential employment opportunities outside their current occupations; by contrast, individuals working in occupations with skills and knowledge that are transferable to only one or two other occupations are likely to have few potential employment opportunities outside their current occupations.

For some occupations, most of the skills and knowledge required for employment are developed in high school, and any required additional training can usually be provided in a relatively short period of time. For example, information in the National Occupational Classification shows that the occupation 'General Office Clerk' requires only completion of high school education; and any required additional training (such as operating a word processor), can be provided in a relatively short period of time. It follows that increases in the demand for 'General Office Clerks' can probably be met through short-term training programs for workers in many other occupations. Thus employment opportunities in this occupation (and in others for which most of the required skills and knowledge are developed in high school) will not be affected by the skills transferability from other occupations. Occupations that usually require only high school completion or less education are therefore excluded from the Model developed here.

For other occupations, the skills and knowledge required for employment are developed through specialized education and training (such as that available in university or college level programs or courses) or through many years of work experience and on-the-job training. Since it would take a relatively long time to provide new entrants with the required specialized education and training, increases in the demand for workers in such occupations can only usually be met over the long term. However, workers in occupations in which the factors required for employment are similar (and hence with skills that are transferable) could provide a valuable source of labour over the short-term. In other words, workers in such occupations have some flexibility because of the skills and knowledge they possess, and they can be substituted for one another in the production process.

As an example, consider the occupation 'Financial Auditors and Accountants'. The information available shows that the education, training, work responsibilities, employer requirements, and other such factors required for employment as 'Financial Auditors and Accountants' are similar to the factors required for employment in some other occupations requiring specialized education and training (such as 'Administrative Officers' and 'Bookkeepers'). It follows that 'Financial Auditors and Accountants' would also be able to work in these other occupations. Thus if the demand for workers in those occupations (such as 'Administrative Officers') were to increase, 'Financial Auditors and Accountants' could be employed in the short-run to meet the demand.

However, some occupations that require skills and knowledge developed through specialized education and training, are quite different from other occupations in terms of the factors required for employment: thus, the skills and knowledge required for such occupations are not transferable to other occupations. Workers in such occupations therefore have little flexibility in terms of the skills and knowledge they possess, and they cannot usually be substituted for workers in other occupations.

As an example, consider the occupation 'Air Pilots, Flight Engineers and Flying Instructors'. The information in the National Occupational Classification for the occupation shows that the work in this occupation is quite different from that in all other occupations: thus the skills and knowledge possessed by 'Air Pilots, Flight Engineers and Flying Instructors' are not required in any other occupation. It follows that 'Air Pilots, Flight Engineers and Flying Instructors' would not be able to use their skills and knowledge in other occupations.

The transferability of skills and knowledge between occupations forms a core component in the Model described in this Report. In the Model, employment opportunities will be high for occupations with high skills transferability; by contrast, employment opportunities will be low for occupations with low skills transferability.

2.2.2 *Barriers that restrict entry to some occupations*

We define occupational barriers as entry requirements that seek to control access to employment in different occupations. For example, individuals who want to work as a 'Lawyer' must meet specified requirements before they can enter the occupation. These requirements can usually be met in Canada by undertaking an appropriate education and training program.

New immigrants (who received their education/training outside Canada) cannot enter some occupations without meeting the entry requirements, and hence cannot work in those occupations immediately upon entering Canada. Such occupational barriers form an important component in the Model: although the same skills and knowledge may be required in two occupations, entry to one of these occupations may be prevented or restricted because of an occupational barrier.

2.2.3 Earnings in different occupations

As noted above, the standard approach in economics assumes that if relative wages were to rise in a given occupation, workers would be encouraged to move to that occupation. Relative wages, or earnings, are therefore included as a factor in the Model. In the Model, employment opportunities will be high in occupations with relatively high earnings; and employment opportunities will be low in occupations with relatively low earnings.

2.2.4 Job prospects in different occupations

Better job prospects point to more employment opportunities. The job prospects in different occupations are therefore included as a factor in the Model: employment opportunities will be high in occupations with relatively good job prospects, and they will be low in occupations with relatively poor job prospects.

2.2.5 The level of employment in different occupations

Occupational opportunities also depend on the size of occupations: for example, labour turnover will tend to be higher for larger than for smaller occupations. Occupation size is therefore included as a factor in the Model: employment opportunities will be high in occupations that are relatively large, and they will be low in occupations that are relatively small.

2.3 Specification of the Model

The Model can be expressed as the product of a number of matrices:

$$\mathbf{DI} = \mathbf{ABPGEW}$$

where:

DI is a column vector showing the value of the Derived Index for potential employment in each occupation.

A is a square matrix of coefficients of skills transferability between occupations.

B is a diagonal matrix in which each element is an index of the barrier to entry into a given occupation.

P is a diagonal matrix in which each element is an index of the earnings in a given occupation.

G is a diagonal matrix in which each element is an index of the job prospects in a given occupation.

E is a diagonal matrix in each element is an index of the level of employment in a given occupation.

W is a column vector in which each element is the inverse of the total number of occupations in the Model.

In this formulation of the Model, the Derived Index for each occupation is given by a linear equation based on the five factors (the linear equation for a given occupation is shown in Appendix I). The values of the factors in the Model (that is the elements in each matrix) are all constrained to lie between 0 and 1. As noted in Appendix I, this means that the minimum value of the Derived Index is 0, and the maximum value is 1.

- Skills transferability matrix

  The element for an occupation in the skills transferability matrix is assigned a value of 1 if the potential for skills transferability to another occupation is high; and it is assigned a value of 0 if the potential for skills transferability from one occupation to another is low.

- Occupational barriers matrix

  The matrix (diagonal) element in the occupational barriers matrix is assigned one of three possible values for each occupation: 0 (for an occupation with an effective barrier); 0.5 (for an occupation with a partially effective barrier); and 1 (for an occupation with an ineffective barrier or no barrier).

- Matrix of an index of the earnings in each occupation

  The index of earnings used in the Model is based on average earnings derived from the 1996 Census. The index used is defined as earnings in the given occupation divided by earnings in the occupation with the highest earnings. The index therefore lies between 0 and 1. (As one of the referees of this Report suggested, it would be interesting to use the relative change, instead of the level, in average earnings in this index).

- Matrix of an index of the job prospects in each occupation

  The 2000 website version of *Job Futures* includes three indicators of the prospects for different occupations: limited; fair; and good. These are expressed in index form (0; 0.5; and 1 respectively) so that the index falls in the range 0 to 1.

- Matrix of an index of employment in each occupation

  The index of employment used in the Model is based on employment derived from the 1996 Census. The index is defined as employment in the given occupation divided by employment in the occupation with the highest employment. The index therefore lies between 0 and 1. (One of the referees of this Report also suggested that it would be interesting to use the relative change, instead of the level, in employment in this index: it would be straightforward to do so in the Model).

2.4 Understanding how the Model works

In the Model, the Derived Index for a given occupation (which because of the structure of the Model must lie between 0 and 1) depends not only on the values of the factors that directly affect it, but also on the effects of the factors on the other occupations to which transfer is potentially possible. Thus the Index for a given occupation depends on:

- The other occupations to which transfer is potentially possible;
- The effectiveness of barriers to entry in the given occupation and in the other occupations to which transfer is potentially possible;
- The level of earnings in the given occupation and in the other occupations to which transfer is potentially possible;
- The job prospects for the given occupation and for the other occupations to which transfer is potentially possible; and
- The level of employment in the given occupation and in the other occupations to which transfer is potentially possible.

2.4.1 An example of how the Index is affected by the various factors

It is helpful to use an example to demonstrate how the various factors affect the outputs in the Model. Consider the occupation 'General Practitioners and Family Physicians'. The occupational barriers matrix (see Appendix V) shows that a licence is required to work in this occupation, and this licence acts as a barrier that controls entry to the occupation. Thus new immigrants to Canada would not be able to enter the occupation without the required licence (and hence without testing/further training): it follows that there are no employment opportunities for new immigrants in this occupation. The Derived Index for the occupation would therefore be 0 unless new immigrants in the occupation were able to use their skills and knowledge in some other occupation.

The skills transferability matrix (Appendix IV) shows that 'General Practitioners and Family Physicians' can use their skills and knowledge in three other occupations: 'Biological Technologists and Technicians', 'Medical Laboratory Technologists and Pathologists' Assistants', and 'Medical Laboratory Technicians'. Thus even though new immigrants who worked as 'General Practitioners and Family Physicians' outside Canada would not be able to work immediately in the same occupation in Canada, there would still be some occupations in which they could use their skills and knowledge. It follows that the value of the Derived Index for 'General Practitioners and Family Physicians' will not be 0: the value will depend on the values of the factors in the three other occupations to which their skills and knowledge are transferable ('Biological Technologists and Technicians', 'Medical Laboratory Technologists and Pathologists' Assistants', and 'Medical Laboratory Technicians').

2.4.2 Some observations on the size of the Derived Index

The example above provides a basis for making several observations about the size of the Derived Index for an occupation:

- The Derived Index will be 0 for an occupation with no potential for skills transferability to any other occupation *and* with an effective barrier (i.e. the value of

the occupational barrier index would be 0). In this case, the values of the other factors for the occupation (earnings, job prospects, and employment level) would have no effect on the Derived Index.

- The Derived Index will not be 0 for an occupation with an effective barrier if skills transferability to at least one other occupation were potentially possible. In this case the values of the other factors in the occupations to which skills transfer is possible (earnings, job prospects, and employment level) would affect the Derived Index.
- The Derived Index will be high if the skills used in an occupation were transferable to many other occupations, if there were no barrier to entry into the occupation, if the earnings in the occupation were relatively high, if the job prospects in the occupation were good, and if the level of employment in the occupation were relatively high.
- The Derived Index will be low if the skills used in the occupation were transferable to only one or two occupations, if there were a barrier to entry into the occupation, if the earnings in the occupation were relatively low, if the job prospects in the occupation were poor, and if the level of employment in the occupation were low.
- The Derived Index will be at 1 (the maximum possible value) for an occupation with the potential for skills transferability to every other occupation *and* with no effective barrier, as well as indices of earnings, job prospects and level of employment all equal to 1: this is not likely to be attainable in practice.

2.5 Other potential uses of the Model

2.5.1 Using the Model for new immigrants and workers already in the Canadian workforce

Occupational barriers may affect new immigrants in two different ways:

- They may restrict or prevent new immigrants in a given occupation from working in the *same* occupation in Canada. For example, new immigrants who have worked as 'General Practitioners and Family Physicians' outside Canada would not be able to work in the same occupation in Canada without testing and/or additional education and training.
- They may restrict or prevent new immigrants in a given occupation from working in a *different* occupation in Canada. For example, new immigrants who have worked as 'General Practitioners and Family Physicians' would not be able to work 'Medical Radiation Technologists' in Canada without additional education and training.

The Model described in this Report *includes* the effects of barriers in restricting or preventing entry to the same occupation. It can therefore be used directly for the selection or counselling of new immigrants. For example, the Model can be used for addressing questions such as the following:

- What are the potential employment opportunities for new immigrants in a given occupation?
- Which are the occupations in which new immigrants are likely to have the most potential employment opportunities in Canada?
- Which are the occupations in which new immigrants are likely to have the least potential employment opportunities in Canada?

The effects of barriers in restricting or preventing new immigrants in a given occupation from working in the *same* occupation in Canada will not usually be relevant for workers already in the Canadian workforce unless they also want to change province/territory. For example, individuals working as 'Secondary School Teachers' in a given province/territory would be able to work in the same occupation in the same jurisdiction; but testing and/or additional education and training might be required if they wanted to work in a different jurisdiction. By contrast, the effects of barriers in restricting or preventing new immigrants in a given occupation from working in a *different* occupation in Canada will also be relevant for workers already in the Canadian workforce.

The Model described in this Report can be modified so that it can be used for identifying new employment opportunities for those already working in Canada. In this case, the Model should *exclude* the effects of barriers in restricting or preventing entry to the same occupation (that is, the diagonal elements in the matrix of occupational barriers should all be 1). The Model could also be adapted to study the effects of barriers that restrict or prevent workers in a given occupation and in a given province/territory from working in the same occupation but in a different province/territory.

Thus the Model can be modified so that it provides information on occupational choice for workers in the Canadian workforce. The Model could then be used to address questions such as the following:

- What are the potential employment opportunities for workers in a given occupation in the Canadian workforce?
- Which occupations provide the most potential employment opportunities for workers in Canada?
- Which occupations provide the least potential employment opportunities for workers in Canada?

It should be noted that the Model could also be adapted to provide information on occupational choices for new graduates in Canada. This would require the development of an additional model for identifying the occupational choices of new graduates in different fields of study (and hence with particular skills and knowledge).

2.5.2 Applying the Model for different provinces and territories

As noted above, occupational barriers are entry requirements that seek to control access to employment in different occupations. Some occupational barriers are specified at the federal level and hence apply in all provinces and territories: for example, a federal licence is required for workers in 'Air Traffic Control Occupations'. However, barriers in most occupations are specified at the provincial or territorial level, and they often vary from one jurisdiction to the other. For example, 'Respiratory Therapists and Clinical Perfusionists' are licensed in Quebec, Manitoba, Alberta and British Columbia, but not in the other jurisdictions.

The Model described in this Report is national and takes no account of jurisdictional differences. Jurisdictional differences in occupational barriers usually imply that there is an effective barrier in some jurisdictions but not in others. In the Model we treat such barriers as being partially effective. This seemed to be a reasonable approach for an exploratory model as described in this Report. It would be preferable to develop a model for each jurisdiction, but this would imply the development of 13 different models.

The Model described here can be used as a basis for developing a model for different jurisdictions. The report on formal occupational barriers (prepared by Jo-Ann Sobkow) includes information the barrier for each occupation in the different provinces and territories. These can easily be extracted to provide the basis for a provincial or territorial model. However, some additional empirical work will be required to identify informal occupational barriers. Data on the economic factors in the Model (earnings, job prospects, and employment level) must also be obtained for different jurisdictions.

2.5.3 Modifying the values of the parameters in the Model

The Model described here is based on particular values of the parameters, but these can easily be changed for exploratory analysis. For example, the earnings and employment in different occupations are based on 1996 Census data; these can easily be replaced by estimates from the 2001 Census to update the Derived Index for each occupation.

Moreover, the measure used for the different parameters can easily be changed and applied in the Model. For example, (as suggested by one of the referees to this Report) the change in earnings and employment could be substituted for the levels used in the current model: an argument for doing so is that the Derived Index would then be sensitive to changing labour market conditions.

One particularly interesting modification in the Model would be to introduce some variation in the coefficients of skills transferability (this was also suggested by one of the referees of this Report). Only two possible values for the skills transferability coefficients (0 and 1, representing 'low' and 'high' skills transferability respectability) are included in the Model described here. However, in our analysis we identified some occupations in

which it may be more appropriate to allocate a value between 0 and 1. Some additional research would be required to explore different possibilities and their potential impact on the Derived Index.

2.6 Electronic version of the Model

The Model has been developed in Excel with separate Spreadsheets for the instructions for use, and for the matrices for the skills transferability coefficients, the occupational barriers, the indices of earnings, the indices of job prospects, and the indices of the level of employment. The results of the matrix multiplication at each stage are also included in separate Spreadsheets.

The use of Excel and the inclusion of all of the matrices that make up the Model mean that the file is rather large. However, a major advantage of this approach is that the elements of the Model are completely transparent: it follows that it would be easy for users to critically examine all of the assumptions in the Model, and to examine the effects of changes in the values of the factors. The Model can be simplified but there would be a cost in terms of loss of transparency.

The Model can be used fairly easily for policy simulations and for testing the sensitivity of the Derived Index to different assumptions. It can also be easily updated as better and more up-to-date data become available. For example, it would be easy to change the matrix of job prospects using more recent data from *Job Futures*, or to change the indices of earnings and of the level of employment by occupation when data become available from the 2001 Census.

3. Skills transferability

3.1 Occupations and skills transferability

The concept of skills and knowledge (or occupational) transferability is a key element in the Model: it is based on the terms 'occupation', 'job' and 'skills and knowledge'. These are therefore defined below:

- An occupation is defined as a collection of jobs that are similar in terms of the type of work performed: such jobs are grouped together in an occupational classification system (e.g. the National Occupational Classification).
- A job is a specific employment position, and it reflects the tasks and responsibilities required of an individual in that position.
- Skills and knowledge are attributes possessed by individuals that are necessary for efficiently carrying out the tasks in jobs.

Some individuals possess the skills and knowledge (or skills for short) that allow them to perform only a limited number of tasks; the jobs open to them are therefore limited, and so too are the occupations in which they are able to work. Other individuals possess skills that allow them to perform a range of tasks; many jobs are open to them, and they are sometimes capable of working in a range of occupations.

The elements in the skills transferability matrix reflect the extent to which the same skills are required in two occupations: they therefore show the potential for the use of these skills in the two occupations (that is, the potential for skills transferability). The matrix element for an occupation is assigned a value of 1 if the potential for skills transferability to the other occupation is 'high'; it is assigned a value of 0 if the potential for skills transferability from one occupation to another is 'low'. 'High' and 'low' are determined by subjective assessment of the information available for each occupation (see 'Matrix of Skills Transferability', by Margaret Roberts).

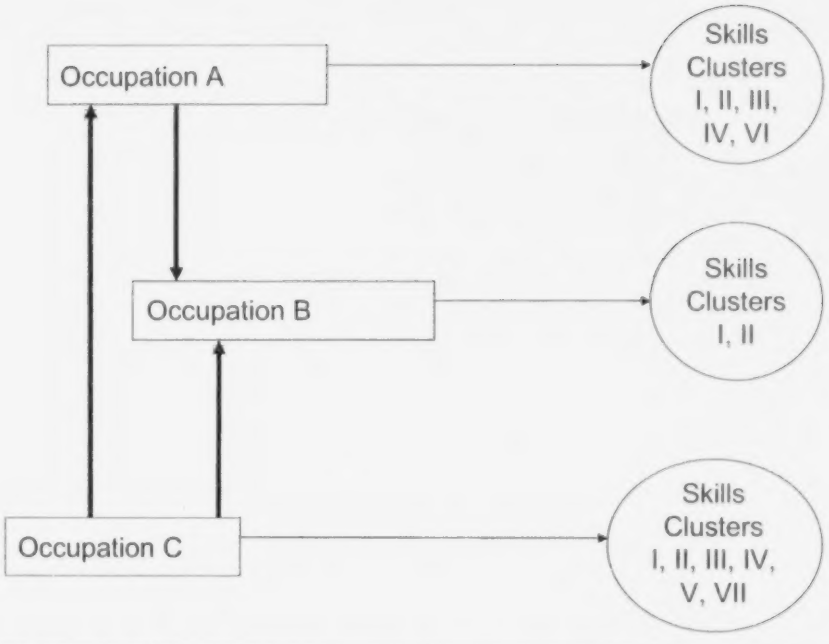
The schematic diagram in Chart III.1 may help to provide a better understanding of the method used to derive the coefficients of skills transferability. Assume for simplicity a system with 3 occupations and 7 clusters of skills and knowledge. As indicated in the diagram, assume that efficient performance of the tasks in 'Occupation A' requires clusters of skills and knowledge I, II, III, IV and VI. Efficient performance of the tasks in 'Occupation B' requires clusters of skills and knowledge I and II; and efficient performance of the tasks in 'Occupation C' requires clusters of skills and knowledge I, II, III, IV, V and VII.

Most of the clusters of skills and knowledge required for 'Occupation A' are also required for 'Occupation C', so that transfer may be possible from 'Occupation C' to 'Occupation A' (the coefficient of skills transferability in this case is 1). But the reverse

is not assumed to be the case since two critical clusters of skills and knowledge (V and VII) are required for 'Occupation C' but not for 'Occupation A'.

Since only two clusters of skills and knowledge (I and II) are required for 'Occupation B' and these are also required for 'Occupation A' and for 'Occupation C', transfer from 'Occupation A' or from 'Occupation C' to 'Occupation B' is possible (the coefficient of skills transferability in both cases is 1). At the same time, transfer from 'Occupation B' to 'Occupation A' or to 'Occupation C' is not possible since workers in 'Occupation B' do not possess any of the other clusters of skills and knowledge required for the other two occupations (the coefficient of skills transferability in each case is 0).

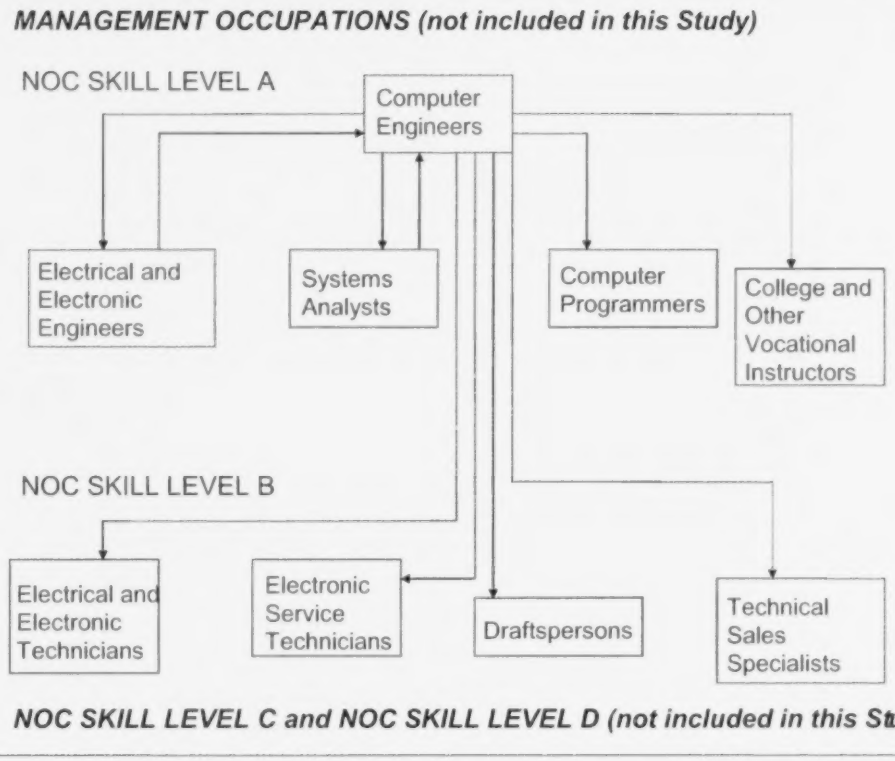
Chart III.1
Schematic diagram showing the commonality of skills and knowledge between occupations


Occupation A
Skills Clusters I, II, III, IV, VI
Occupation B
Skills Clusters I, II
Occupation C
Skills Clusters I, II, III, IV, V, VII

Individuals in different occupations may be able to acquire the skills and knowledge required for another occupation through education and training. But the time and resources required would vary by occupation, and so would the potential for adjustment. For example, workers in 'Occupation B' may be able to acquire the skills and knowledge in three clusters (III, IV and VI) quickly and at relatively low cost; they could therefore improve their potential for transfer to 'Occupation A' over the short-term. By contrast, it may be the case that the skills and knowledge in the two critical clusters in 'Occupation C' (V and VII) can only be acquired over the long-term and at relatively high expense, so that workers in 'Occupation B' could only improve their potential for transfer to 'Occupation C' over the long-term.

An example using an actual occupation may be helpful. The schematic diagram in Chart III.2 shows how we identified the skills transferability coefficients for the occupation 'Computer Engineers', which is an occupation at Skill Level A in the National Occupational Classification (NOC).

Chart III.2
Schematic diagram showing the relationship between Computer Engineer and other occupations in the Skills Transferability Matrix


MANAGEMENT OCCUPATIONS (not included in this Study)
NOC SKILL LEVEL A
Computer Engineers
Electrical and Electronic Engineers
Systems Analysts
Computer Programmers
College and Other Vocational Instructors
NOC SKILL LEVEL B
Electrical and Electronic Technicians
Electronic Service Technicians
Draftspersons
Technical Sales Specialists
NOC SKILL LEVEL C and NOC SKILL LEVEL D (not included in this Study)

Some of the clusters of skills and knowledge required for 'Computer Engineers' are also required for 'Management Occupations', and for occupations in NOC Skill Level C and NOC Skill Level D. It follows that some 'Computer Engineers' would likely be able to work in 'Management Occupations', or in occupations in NOC Skill Level C and NOC Skill Level D. However, 'Management Occupations' and occupations in NOC Skill Level C and NOC Skill Level D are not included in the Model (for reasons explained later in this chapter): they are therefore ignored in the diagram.

Some of the clusters of skills and knowledge required for individuals to work as 'Computer Engineers' are also required for individuals to work as 'Electrical and Electronic Engineers', 'Systems Analysts', 'Computer Programmers' and 'College and Other Vocational Instructors' (NOC Skill Level A). It also seems likely that some of the critical clusters of skills and knowledge required for 'Electrical and Electronic Engineers' and 'Systems Analysts' would be required for 'Computer Engineers'. It follows that in these two cases, there is a potential for skills transferability in both directions: that is,

individuals who work as 'Computer Engineers' could work instead as 'Electrical and Electronic Engineers' and 'Systems Analysts', and *vice versa*.

We also assume that some of the clusters of skills and knowledge required for 'Computer Engineers' are the same as those required for 'Computer Programmers', so that 'Computer Engineers' would therefore be able to work as 'Computer Programmers'. At the same time, we assume that some of the clusters of skills and knowledge required for 'Computer Engineers' are not required for 'Computer Programmers'. Thus individuals working as 'Computer Programmers' may not possess the clusters of skills and knowledge required for 'Computer Engineers': thus we assume that transfer from the occupation 'Computer Programmer' to the occupation 'Computer Engineer' is unlikely without additional education and training.

Some 'Computer Engineers' have the skills and knowledge to work as 'College and other Vocational Instructors' (NOC Unit Group 4131). However, NOC Unit Group 4131 is a heterogeneous group in terms of the clusters of skills and knowledge required. This unit group was therefore excluded from the Model (this is discussed in detail later in this chapter). 'Technical Sales Specialists' is also a heterogeneous unit group in the NOC and it too has been excluded from the Model.

Our analysis suggests that some of the clusters of skills and knowledge required for individuals to work as 'Computer Engineers' are also required for individuals to work as 'Electrical and Electronic Technologists and Technicians', 'Electronic Service Technicians', and 'Draftspersons'. Thus we assume that transfer from 'Computer Engineers' to each of the three occupations is possible. Note again that we assume that the reverse would not be possible without additional education and training.

3.2 Identifying the coefficients of skills transferability

Identifying the elements in the skills transferability matrix would be fairly straightforward if the skills associated with each occupation were clearly identified, and if occupations were all homogeneous. But this is not the case. We therefore had to use the information available to make judgements about the potential for skills and knowledge transferability between occupations.

It was not always easy to find information that is relevant to the skills and knowledge required in occupations, and hence that would be useful in making these judgements. We therefore used a variety of methods and sources of information. Even so, it was difficult to find the information required for some occupations (such as those that require little formal education or training). Our experience therefore suggests that the information available on occupations is not adequate for a complete analysis of the skills and knowledge requirements of occupations.

We used the National Occupational Classification (NOC)[1] as the primary source of information for this study. The NOC and its related sub-systems provide the most reliable source of qualitative information on occupations in Canada. Information from the NOC, from the Career Handbook, and from the JOBSCAN Skill Profiles (developed by HRDC) formed the primary basis for our assessment of the potential for skills transferability (or mobility) between occupations. We used other sources of relevant data (such as census data) as a supplement to the three main sources of information: but these supplementary data were used in a *qualitative* way to illuminate and confirm the potential mobility patterns between occupations.

3.3 Skills transferability and the labour market

The notion of skills transferability we use here is simple. The elements, or coefficients, of the transferability matrix reflect the extent to which the skills and knowledge required in one occupation can be used in another: they therefore indicate the potential for transfer from one occupation to the other. But *measuring* the coefficients is complex. In our approach we assume that similar skills and knowledge are required in occupations that are similar in terms of education, training, the nature of work responsibilities, employer requirements, and other such factors. Thus we assign a value of 1 for the coefficient between occupations with a high degree of similarity, and a value of 0 for the coefficient between occupations with a low degree of similarity.

This approach is arbitrary and somewhat crude. For example, deciding if there is a 'high' degree or 'low' degree of similarity between two occupations (and hence assigning a value of 1 or 0 for the coefficients) is a matter of judgement; other analysts might have assigned different values. Moreover, we have only assigned two possible values for the coefficients, so that we do not allow for the variation in the degree of similarity between occupations (and hence for coefficients that are neither 1 nor 0).

Our view is that our approach provides a reasonable first approximation, and additional analysis would be useful in developing a method for assigning a range of values for the coefficients. For example, a useful extension of our approach would be to identify the additional education and training (and the time required for that education and training) that would be necessary to increase the potential for skills transferability between two occupations. This would provide a basis for identifying the occupations to which transfer may be possible over the short-term.

Other methods can of course be developed to measure the coefficients. For example, an alternative approach would be to use empirical estimates of occupational mobility as a measure of the coefficients. But the major weakness in such an approach is that the coefficients derived in this way would be sensitive to labour market conditions and to measurement errors and other variation; they would therefore tend to vary significantly over time. Moreover, few data are available in Canada for empirically estimating occupational transfers. The National Graduates Surveys (NGS) include information on

[1] See the Report 'Matrix of Skills Transferability' (prepared by Margaret Roberts) for a more complete explanation of the conceptual basis and methodology of the NOC, and of their possible impacts on this study.

the occupations of workers at two points in time and hence provide a basis for estimating the coefficients; but these data are of limited use since they only cover the occupations of new graduates two years and five years after graduation.

It should be emphasized that the coefficients of skills transferability we identify reflect the *potential* for transfer between two occupations: that is, they show the occupations in which individuals in a given occupation *could* work because of the skills and knowledge they possess. But labour market conditions will determine the extent to which individuals will want to change occupation, and hence *actual* mobility. For example, workers in 'Occupation A' (Chart III.1) are also able to work in 'Occupation B'; but if wages were much lower in 'Occupation B' than in 'Occupation A', workers in 'Occupation A' would not likely want to move to 'Occupation B'.

3.4 The National Occupational Classification (NOC) and related systems

The NOC is quite different from the Canadian Classification and Dictionary of Occupations (CCDO), which it replaced. The CCDO provided a logical basis for classifying occupations, but it did not provide a basis for differentiating between the levels of skills usually required for different occupations. The NOC was designed to fill this gap and to provide a system that would be more useful for labour market analysts, researchers, counsellors, students and educators. Moreover, the NOC is based not only the content of occupations, but also the relationships between occupations.

The NOC covers more than 25,000 job titles in Canada, and these are classified into three levels: 26 major groups (2-digit), 139 minor groups (3-digit), and 522 unit groups (4-digit). The classification provides an overall structure and framework for all components in the system, as well as descriptions of the tasks and educational and/or training requirements for each occupation. Most 4-digit unit groups are clusters of jobs that share some commonality with respect to knowledge and skills.

The classification system is based on four elements: skill level, skill type, occupational mobility and industry. Skill level is defined as the amount and type of education and training required to enter and perform the duties in an occupation. The experience required for entry and the complexity and responsibilities usually associated with an occupation were also considered in determining the skill level.

Skill type is broadly defined as type of work. It can be a function (e.g. management, clerical, and sales), or a subject matter, (e.g. science, health, social science, culture, and skilled trades), or an industry (primary industry, and manufacturing). The element believed to best represent the 'sense' of the occupational cluster was chosen as its defining element. This is one of the reasons that the NOC is considered to be a skill-based occupational system.

The criterion used for occupational mobility in the NOC was that 'mobility between occupations within a unit (4-digit) group would be greater than mobility to any other unit

group'. Moreover, unit groups were allocated within the skill types in the NOC Matrix so as indicate the likely paths of occupational mobility.

Industry was used, as a classification principle, when occupations could be best understood within the context of an industry. This was the case for production workers in manufacturing and processing occupations, as well as for workers in agriculture, fishing, mining and forestry. In such cases, there is generally little occupational mobility outside the industry; and career paths are based on the mobility of workers within the specific industry, and often within a given firm.

The information contained in the NOC and its related systems include:

- **Lead Statement and Occupational Description:**

  In the NOC, the *Lead Statement* for an occupation defines the scope and general content of the occupation. The *Occupational Description* provides a list of important activities that define the occupation.

- **Employment Requirements:**

  Employment Requirements for an occupation usually include requirements for education and training, and for certification and licensing; they sometimes also include requirements for specific experience. They often identify differences that would hinder movement between occupations; and they sometimes identify opportunities for mobility. *Employment Requirements* were developed using information supplied by business, governments, labour, industry and professional associations.

- **Additional Information:**

  Additional Information for an occupation is sometimes used to identify opportunities for mobility to other occupations. For example, *Additional Information* for the occupation 'Electrical and Electronics Engineering Technologists and Technicians' (NOC 2241) states that: 'There is mobility to other related occupations such as technical sales, electronics service technicians, instrument technicians and avionics technicians. Progression to managerial positions in engineering, production or operations is possible with experience'. Unfortunately, *Additional Information* is only available for some NOC groups.

- **Career Handbook:**

  The *Career Handbook*, which is organized according to the NOC structure, relates work to people by providing ratings and descriptions of worker traits, such as aptitudes, interests, and a group of worker functions 'Data/Information, People, Things (DPT)'. The ratings provide a basis for comparing the work in different occupations; and although they do not deal directly with the potential for mobility between occupations, comparison of the ratings may be helpful in identifying potential employment opportunities.

- **Skills Profiles:**

  Skills Profiles include a comprehensive set of skills and knowledge for each NOC occupation, and are therefore useful for comparing the specific knowledge and skills requirements of different occupations. However, skills and knowledge are not described in a consistent way in all occupations so that comparison is not always possible. For example, the same skills and knowledge are sometimes described in different occupations using different words; and the word used to describe the skills and knowledge in one context may sometimes be used differently in a different context.

3.5 Limitations in the structure of the NOC

One of the major problems in the NOC is that the unit groups in the classification do not always represent a unique or distinct occupation. It follows that it is not always possible to determine the potential for skills transfer between NOC unit groups. For example, if a unit group included several distinct occupations, it would be impossible to identify another unit group in which workers in all of those distinct occupations could find employment. For example, the unit group 'Natural and Applied Science Policy Researchers, Consultants and Program Officers ' (NOC 4161) includes a number of distinct occupations (such as 'Ergonomists', 'Occupational Hygienists', 'Patent Agents', and 'Science Policy and Program Officers'). Each of these occupations is unique and there is little overlap between them; it follows there could be no other unit group in which individuals in all the unique occupations in NOC 4161 could find employment.

This limitation clearly has an impact on the NOC unit groups that could be included in this study. To understand the impact, consider the following broad categorization[2] of NOC unit groups into five categories:

Category 1:
Unit groups that consist of a single or distinct occupation, with no significant specializations (e.g. 'Computer Programmers').

Category 2:
Unit groups that include either specializations or variations in the core occupation (e.g. 'Registered Nurses', which includes, for example, 'Psychiatric Nurses', 'Occupational Health Nurses' and 'Nursing Consultants').

Category 3:
Unit groups that contain 2-4 distinct occupations (e.g. 'Air Pilots, Flight Engineers and Flying Instructors').

Category 4:
Unit groups that contain 5 or more distinct occupations, (e.g., 'Specialist Physicians', which includes, for example, 'Cardiologists', 'Psychiatrists', 'General Pathologists', 'General Surgeons' and 'Urologists').

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[2] These categories are based on unpublished HRDC research and development documents related to the NOC.

Category 5:
Unit groups that do not fit the standard definition of an occupation (a collection of jobs that are similar in terms of the type of work performed), and are more appropriately viewed as residual groups containing a collection of different jobs (e.g., 'Machine Operators, Mineral and Metal Processing', which includes, for example, 'Aluminium Classifier', 'Asbestos Drier', 'Brick and Tile Crusher Operator', 'Mica Sheet Laminator' and 'Steel Roller'). The *Additional Information* in the NOC for this unit group indicates that there is little mobility among the various types of machine operators.

In general, unit groups in Categories 1 and 2 represent a single or distinct occupation, so that the potential for mobility between occupations in these categories can usually be assessed in a straightforward manner.

For unit groups in Categories 3 and 4, a single judgment may not be possible at the 4-digit level in the NOC. For example, NOC 4169 includes a variety of classical and social science occupations, e.g. 'Archaeologist', 'Geographer', 'Historian', 'Linguist' and 'Sociologist'. The potential for occupational mobility may be quite different for each occupation within the group, so that it would be difficult to identify a coefficient for the potential occupational mobility of the group as a whole.

For unit groups in Category 5, identifying the potential occupational mobility may not be possible, unless the 4-digit group is part of an internal career ladder or progression. For example, the NOC indicates that 'Labourers in Textile Processing' (NOC 9616) may, with experience, follow a progression to any unit group in the 3-digit group 'Machine Operators and Related Workers in Textile Processing' (NOC 944). However, movements of this type are not particularly useful for this study since most internal progressions of this type occur for occupations in Skill Levels C and D (which are not included in this study).

3.6 The use of quantitative information

As noted above, quantitative information was used in a qualitative to help us identify or confirm our judgements about the skills transferability coefficients. Two sources of quantitative information were used: the National Graduates Survey and the Follow-up Survey of Graduates (for 1990 graduates), and the 1996 population Census. The data used included information on the fields of study of postsecondary graduates in different occupations.

3.6.1 The National Graduates Survey (NGS)

The National Graduates Surveys (NGS) and the Follow-up Survey of Graduates (FOG) provide the only sources of data in Canada that directly include information on occupational changes for the same individuals. The NGS and FOG surveys also include information on the occupations in which graduates in different fields of study found jobs.

However, the usefulness of the data for the study of skills transferability is somewhat limited: the surveys cover only graduates in particular years (such as 1990), and they only

provide information on the occupations of graduates two years and five years after graduation. In addition, the surveys cover only postsecondary graduates; and because of the sample size, reliable estimates cannot be obtained for some 4-digit unit groups.

We used data from the NGS and FOG for graduates in 1990 as a major source of information on mobility between occupations: as noted above, these data were used to help us identify or confirm the potential for mobility between occupations.

3.6.2 The population Census

The population Census provides information on the detailed occupations of the employed population; but no information is available on the occupations of the same individuals at different points in time, so that the data cannot be used for assessing the potential for mobility between occupations. The Census also includes information on the major field of study of workers in different occupations.

3.6.3 Field of Study

As noted above, because of the limited data that can be used to estimate mobility between occupations, we used field of study (FOS) to help us do so indirectly for some occupations. Data on the field of study of postsecondary graduates are available from the NGS by level of education (Ph. D., Masters, Bachelors, College and Trade/Vocational). Data by field of study and by level of education are also available from the Census.

Some occupations are closely related to particular fields of study, and in these cases data on field of study and occupation may provide a basis for drawing rough inferences about the potential for occupational mobility. For such occupations, we first tried to identify a one-to-one relationship between the field of study and the occupation. To do so we posed the following question: 'Is it likely that the opportunities for occupational mobility of persons in occupation 'x' can be identified if we know the employment outcomes of graduates in field of study 'y'? One clue in addressing this question is that in such cases field of study and occupation must be contained within exactly the same scope of work. This is the case, for example, for the occupation 'Economist' and the field of study 'economics'; but it is not the case for the occupation 'Nurses Aide' and the field of study 'other nursing'.

The field of study must also provide an essential link with a related occupation: for example, professional degrees in 'law' provide an essential link with the occupation 'Lawyers'; the same is the case for the field of study 'medicine' and the occupation 'General Practitioners and Family Physicians'. But the field of study 'commerce' does not provide an essential link with 'Financial Auditors and Accountants'. There may be an indirect link; but the field of study 'commerce' cannot be treated as a proxy for the number of 'Accountants'.

Whenever possible, we identified the field of study of NOC occupations to allow for additional analysis using the NGS and the census. The level of education recorded in NOC *Entry Requirements* was used to determine the appropriate level of education for each field of study. For example, the appropriate level of education for the occupation 'Psychologists' is a Master's degree or a Ph.D., and the appropriate level for the occupation 'Engineers' is a Bachelor's degree. The appropriate level for the occupation 'Engineering Technologists' is a College diploma/certificate, even though empirical data show that many of those working as 'Engineering Technologists' have completed a Bachelor's degree.

3.7 Procedures for making judgements about skills transferability

The following examples illustrate the procedures we used for making judgements about skills transferability:

- The occupations to which skills transfer is potentially possible ('destination' occupations) from a given occupation ('original' occupation) were selected on the basis of some observed commonality in the knowledge and skills required for the original occupation and for the destination occupations. In many cases the Skill Level for the destination occupations was lower than that for the original occupation.

  For example, the knowledge and skills acquired in the study of 'biology' and 'medicine' are required for employment as 'General Practitioners and Family Physicians' (NOC 3111); thus it is reasonable to assume that individuals working as 'General Practitioners and Family Physicians' could also work as 'Medical Technologists' (NOC 3211) with little additional training. Similarly, it is reasonable to assume that because of their knowledge of 'accounting', 'Financial Auditors and Accountants' would have the skills necessary to work as 'Bookkeepers'.

- Occupations that require considerable retraining of individuals in a given original occupation are not included as destination occupations for that occupation. For example, data from the National Graduates Survey (NGS) show that many graduates in 'mathematics' at the Bachelor's level work as 'Financial Auditors and Accountants'. However, it does not seem reasonable to assume that this transfer can be attributed to the skills and knowledge developed in the study of 'mathematics'; it is more reasonable to assume that it is the result of some additional training, either on-the-job or through additional courses. The unit group 'Financial Auditors and Accountants' is therefore not included as a destination occupation for the unit group 'Mathematicians, Statisticians and Actuaries'.

  Similarly, the unit group 'Secondary School Teachers' is not considered to be a destination occupation for the unit group 'Painters and Sculptors' since teacher training is normally required for teaching in secondary schools. There are some exceptions (such as some private schools), but it is not likely that they form a significant proportion of the labour market for 'Secondary School Teachers'.

- In a few cases there is an overlap between the skills and knowledge in different occupations, or between the components of different occupations. For example, the unit group 'Chemists' is likely to be related to the unit group 'Geologists, Geochemists and Geophysicists' because of some overlap in the study of geochemistry. Similarly, the unit group 'Physicists and Astronomers' is likely to be related to the unit group 'Biologist and Related Scientists'. Note that it is difficult to determine the significance of such overlap without further study.

- It seems reasonable, in general, to assume that a skills and knowledge overlap is more likely to affect the potential transferability from a general occupation to a highly specialized occupation than *vice versa*. In the example above, it was suggested that it is reasonable to assume that the occupation 'Chemists' is related to the unit group 'Geologists, Geochemists and Geophysicists'. The assumption here is that some 'Chemists' would be able to work as 'Geochemists' because of the skills and knowledge acquired in the study of 'geochemistry'. Note, however, that the converse is not assumed to be possible: thus it is not assumed that transfer from the unit group 'Geologists, Geochemists and Geophysicists' to the unit group 'Chemists' is potentially possible.

  Similarly, it is assumed that there is a link between the unit groups 'Mechanical Engineers' and 'Aerospace Engineers' since (as noted in the NOC) the study of 'mechanical engineering' can be required for 'Aerospace Engineers'. However, the converse (that there is potential transferability from the occupation 'Aerospace Engineers' to the occupation 'Mechanical Engineers') is not assumed to be possible.

- In some cases a destination occupation is only one of several occupations in a heterogeneous unit group; in such cases, it would not be appropriate to identify the unit group as a destination occupation. For example, it is likely that 'Physiotherapists' will be able to perform the work of 'Massage Therapists'. However, 'Massage Therapists' are included in the unit group 'Other Technical Occupations in Therapy and Assessment', which includes at least 6 unrelated technical occupations. Thus it is not reasonable to include this unit group as a possible destination for 'Physiotherapists'.

- In identifying coefficients of skills transferability, our intention was to identify overlaps and similarities between the skills and knowledge in different occupations. Thus occupations, which are essentially open to individuals in many occupations and which require no specialized skills or knowledge, are not included as destination occupations.

3.8 Occupations excluded from the Model

As noted above, the Model was designed to provide a basis for exploring the effects of skills transferability on the potential employment opportunities of new immigrants. For this reason, it was initially decided that the occupations in the Model would be restricted to the more highly skilled occupations, that is to those in Management, in Skill Level A and in Skill Level B. Occupations in Skill Level A are usually associated with possession of a university degree, while those in Skill Level B are usually associated with a college certificate or diploma, or formal apprenticeship.

However, when the analysis of skills transferability got underway, it was decided that it would not be appropriate to include Management occupations in the Model since they are grouped in heterogeneous NOC unit groups that vary both in Skill Type (type of work) and in Skill Level. Moreover, since individuals working in Management occupations need not have a university degree or college diploma or certificate, these occupations have not been assigned a Skill Level in the NOC. It is therefore difficult to identify the coefficients of skills transferability for Management occupations.

The Model is used in the application considered in this Report for exploring the potential employment opportunities of new immigrants, so that it is appropriate to focus on new entrants to the labour market. Some work experience is usually required for a job in management, so that new entrants to the labour force (and immigrants) are unlikely to be offered jobs in Management occupations without some (Canadian) experience.

Heterogeneous unit groups (which are made up of a number of discrete occupations or jobs) have also been excluded from the Model. Such unit groups are often simply a residual group for including occupations that have little commonality in terms of skills and knowledge: thus there is little potential for transferability between occupations within the group. When the original occupation does not seem to include a fairly homogeneous collection of skills and knowledge, it is impossible to identify common destination occupations. Similarly, such groups represent a set of destination occupations rather than a unique destination occupation, so that it is difficult to treat the group as a whole as destination occupation. Occupations that have been excluded on this basis include: 'Assessors, Valuators and Appraisers'; 'Landscape and Horticultural Technicians and Specialists'; 'Railway and Marine Traffic Controllers'; and 'Paralegal and Related Occupations'.

For some unit groups, employment is only open to workers already in specific occupations or who work within a specific firm. Thus vacancies in such occupations tend to be filled through internal progression rather than through external hiring. Since such occupations are not open to new entrants to the labour market, they have been excluded from the Model.

4. Occupational barriers

4.1 Introduction

Employment in some professional occupations and trades in Canada is subject to regulation: it is illegal for an individual to work in a regulated occupation without the required registration or licensing. Examples include: 'Professional Engineer', 'Physician', and, in some provinces, 'Carpenter'. Regulatory bodies have the responsibility for setting standards for entry to regulated occupations, and for determining if a given individual meets the standards for entry.

New immigrants to Canada (who were educated and trained outside Canada) must meet the standards for entry before they can practise in a regulated occupation. For example, information in the National Occupational Classification (NOC) indicates that 'General Practitioners and Family Physicians' must complete the qualifying examinations of the Medical Council of Canada and an internship program before working in the occupation. It follows that new immigrants (who received their education and training in a foreign country) would not be able to work in the occupation immediately upon entering Canada. They can, of course, enter the occupation after meeting the entry requirements, and hence after a time lag.

Regulations (certification, licensing, or membership in an association) that govern entry to occupations can be treated as occupational barriers since they restrict the *immediate* employment of new immigrants, that is, until they are able to meet the requirements for entry. In this Report, we refer to such regulations as formal (or institutional) occupational barriers. Formal occupational barriers can usually be identified since documentation on the requirements for entry is generally available for regulated occupations.

Most occupations in Canada are not, however, subject to regulation. For example, there is no legal requirement for a licence or certificate or for registration with an occupational or trade association for individuals to work as 'Computer Programmer'. Employers of workers in non-regulated occupations generally have freedom to determine if an individual is qualified to work in the occupation.

Certification or registration is sometimes available on a voluntary basis for some non-regulated occupations, and employers may require certification as a condition for employment. 'Baker' is an example: certification is available on a voluntary basis, and employers may require trade certification as a condition for employment. We treat such barriers as formal barriers since they may be identified in the documentation. However, they are clearly not as universal or effective as formal barriers in regulated occupations.

New immigrants may also face barriers that are not formal when they try to enter some occupations in Canada. For example, a foreign-trained 'Engineer', who wants to work as a 'Professional Engineer' in Canada, must first work for a few years in a supervised engineering position in Canada: this requirement is documented and identifiable, and we

therefore treat it as a formal barrier. However, some employers are not willing to offer supervised engineering positions to new immigrants, and qualified new immigrants may find it difficult to meet this requirement for a licence. Barriers of this type are generally implemented by employers, so that they are not usually documented and hence are not easily identified: qualified new immigrants may only encounter them when they apply for a job. In this Report, we refer to such barriers as informal occupational barriers.

We identified formal occupational barriers for each jurisdiction in Canada using the approach described in Section 4.2: the full list of formal barriers we identified is included in Appendix D of a report prepared by JoAnn Sobkow (*Report on Formal Occupational Barriers*).

Informal occupational barriers are not often specified or documented, so that they cannot easily be identified. However data on the occupations of immigrants and non-immigrants may be useful in providing insights on the existence of informal barriers: the empirical analysis we used to try to identify informal barriers is summarized in Section 4.3 (further details are available in a report *Identification of Barriers to Occupational Entry: Quantitative Methods Using Census Data*, prepared by Daniel Boothby).

4.2 Formal occupational barriers

4.2.1 Sources of information for identifying formal occupational barriers

In the analysis in this section, we describe the methods we used for identifying the formal or institutional barriers (such as certification, credentials and experience) that govern entry into an occupation. Institutional barriers are based on occupational standards and certificates, which have long been a characteristic of some sectors of the workforce (particularly the trades and professions). A certificate attests that the holder has met specified standards, based on the skills, knowledge and abilities considered to be necessary for performing the functions in an occupation. Certification is a condition for employment in some occupations and in some jurisdictions: it therefore constitutes a formal barrier to immediate entry to some occupations for new immigrants.

Several sources of information are available for identifying institutional occupational barriers. We used three main sources for this Study:

- **The National Occupational Classification (NOC) Career Handbook**
  The contents of the NOC are described in some detail in ***Section III.4*** of this Report.
- **Ellis Chart: A Comparative Chart of Apprentice Training Programs**
  This provides complete details for all occupations requiring apprenticeship training for all provinces and territories in Canada.
- **WorkDestinations** Website
  This website (which is sponsored by the Forum of Labour Market Ministers) is intended to provide a guide to work and relocation in Canada. It is still under development.

We also used three other sources to supplement the information from our main sources:

- The **Canadian Information Centre for International Credentials (CICIC)** Website;
- **Metropolis** Websites; and
- Websites for the Regulatory bodies of occupations.

4.2.2 Types of institutional occupational barriers

There are two broad types of occupational certification in Canada: Licensing, and a Reserved Title.

- Licensing
  A licence provides individuals with the exclusive right to practise in an occupation. Individuals without the appropriate licence would be in breach of the law if they attempted to perform any of the functions associated with the occupation. Examples include: 'Physician', 'Lawyer', 'Architect', 'Pilot' and 'Motor Vehicle Mechanic'.

- Reserved Title
  A reserved title provides individuals with the right to use the reserved title for an occupation. Examples include: 'Chartered Accountant' and 'Engineering Technologist'.

A reserved title regulates the use of an occupation title; but it does not grant monopolistic rights in the labour market to certificate holders (as in the case of licensing). The holders of a reserved title are also typically members of an association and agree to abide by a code of ethics in the occupation.

Individuals without the reserved title for an occupation are not allowed to use any of the adjectives in the reserved title. But they may be employed to perform most of the same functions in that occupation; thus they would be included in the relevant unit group in the NOC. For example, 'Certified Management Accountant' (C.M.A.) is a reserved title, but individuals without the reserved title may be employed to carry out most of the same accounting functions. Workers with and without the reserved title, but performing broadly the same functions, would be included in the NOC as 'Financial Auditors and Accountants' (NOC 1111).

Formal or institutional occupational barriers can be categorized in a variety of ways. We found it convenient to use the following eight categories in our analysis:

- Provincial licence (e.g. 'General Practitioners and Family Physicians');
- Federal licence (e.g. 'Air Traffic Control Occupations');
- Compulsory certification (e.g. 'Baker' in some jurisdictions);
- Voluntary certification (e.g. 'Industrial Instrument Technicians and Mechanics' in most jurisdictions);
- Association membership (e.g. 'Financial and Investment Analysts'), which may be mandatory;
- Provincial registration (e.g. 'Physiotherapists' in most jurisdictions); and
- A combination of regulations (e.g. 'Applied Chemical Technologists and Technicians').

Appendix D of the *Report On Formal Occupational Barriers* (prepared by Jo-Ann Sobkow) indicates the category of the barrier for each jurisdiction and for each occupation in the Model.

4.2.3 The effectiveness of institutional occupational barriers

The effectiveness of institutional barriers varies by occupation. In some occupations, institutional barriers are strictly applied: examples include 'Lawyers' and 'Electricians'. Thus entry to such occupations is restricted to individuals with the appropriate accreditation, so that the barriers can be considered to be highly effective. Such occupations are assigned a coefficient of 0 for use in the Model: this means that entry into the occupation is usually strictly controlled.

At the other extreme, occupations with no institutional barriers are assigned a value of 1 for use in the Model. This means that there are no restrictions to entry in those occupations, and qualified new immigrants may enter the occupation immediately on entering Canada. 'Chemists' is an example.

Many occupations fall between these extremes: entry is not always restricted to those with an appropriate accreditation, or the barriers may be voluntary (in such cases, we consider the barriers to be partially effective). In the Model, we assigned a value of 0.5 for a partially effective barrier: this is somewhat arbitrary, and further research on the implications of the assumption would be useful.

Barriers may be partially effective for a number of reasons. They may not be strictly applied in practice. For example, although 'Civil Engineers' must be members of the provincial professional association to be able to give final approval for some civil engineering projects, employers may in practice employ non-accredited engineers to perform most civil engineering functions. 'Cabinetmaker' is an example of a trade for which the barrier is voluntary, and hence for which the barrier is partially effective.

In some occupations, barriers exist in some jurisdictions but not in others. For example, 'Respiratory Therapists and Clinical Perfusionists' are licensed in Quebec, Manitoba, Alberta and British Columbia, but not in the other jurisdictions. Since the Model is a national model, and takes no account of jurisdictional differences, we treated the barriers in such occupations as being partially effective.

Although we found considerable information on institutional barriers, it was sometimes difficult to determine their effectiveness. For example, the regulations governing employment in specific occupations are usually available from government sources (federal or provincial); but little information is available on their implementation in practice and hence on their effectiveness. Similarly, professional occupational associations also generally provide detailed information about the requirements for membership; but little information is provided on the implementation of these requirements. Some research is available on apparent restrictions on employment in some occupations; but it is not always clear from such studies if restrictions occur because of institutional barriers or because of their implementation (i.e. through informal barriers).

Nevertheless, it is possible to draw a number of broad conclusions about the effectiveness of institutional occupational barriers:

- In general, governments tend to regulate occupations that require strict standards in terms of public health and safety, so that licensing and certification instituted by governments (provincial/territorial or federal) are likely to be highly effective; however, regulation through membership in an association is likely to be only partially effective.

  The numbers of occupations that are regulated by governments vary by occupation major group. For example, most occupations in health are regulated by governments (e.g. 'Pharmacists', 'Registered Nurses', and 'Dental Hygienists and Dental Therapists'). The same is the case for some occupations in Social Science, Education, Government Service and Religion ('Lawyers and Quebec Notaries', 'Secondary School Teachers' and 'Psychologists'), and in Trades, Transport and Equipment Operators and Related Occupations (e.g. 'Electricians – except Industrial and Power System' and 'Plumbers'). This suggests the barriers in many occupations in these occupation major groups will tend to be highly effective.

  However, only a few occupations in Natural and Applied Science Occupations, in Culture and Recreation, in Sales and Service Occupations and in the other occupation major groups are regulated by governments. This suggests that the barriers in most occupations in these major groups will be only partially effective, or not effective at all. Some examples of such occupations include: 'Chemists', 'Computer Engineers', 'Librarians', 'Translators, Terminologists and Interpreters', 'Graphic Designers and Illustrating Artists', 'Retail and Wholesale Buyers' and 'Butchers'.

- The effectiveness of occupational barriers is likely to affect the labour market adjustments made by employers. For example, if the demand for labour in a particular occupation were to rise, employers would likely make adjustments in a variety of ways: they may pay a higher wage rate for the particular type of labour, or they may try to use other types of labour as substitutes, or they may try to employ more new immigrants with the required skills and knowledge, or they may try to lower the entry standards usually required in the occupation, and so on.

  Employing more new immigrants with the required skills and knowledge or lowering the entry standards in the occupation, is not likely to be successful for occupations that are effectively regulated. For example, most occupations in Health, in Social Science, Education, Government Service and Religion, and in Trades, Transport and Equipment Operators and Related Occupations tend to be highly regulated. It follows that employers would not usually be able to employ more new immigrants for occupations in these occupation major groups since new immigrants would not be able to enter them without first meeting the requirements in Canada. Effective regulation also implies that entry standards usually cannot be lowered for occupations in these major groups.

  However, employers clearly have some flexibility in implementing standards in occupations in which the barriers are only partially effective, or not effective at all. It follows that in such cases, employing more new immigrants with the required skills and knowledge, or lowering the standards for the occupation, could be successful as a short-term adjustment strategy to cope with excess demand in an occupation.

For example, employers could adjust to an increase in the demand for occupations such as 'Computer Engineers' and 'Graphic Designers and Illustrating Artists', by recruiting more new immigrants with the required skills and knowledge; or if the supply were limited, they could make additional adjustments by lowering the standards they usually require for entry to these occupations.

4.2.4 Values of institutional occupational barriers used in the Model

We assigned one of three possible values for the institutional barriers for each occupation included in the Model:

- **0 (for an effective barrier)**
  - Federal licensing is required.
  - Provincial licensing is mandatory in all or most provinces and territories.
  - Provincial registration is required.

  Examples of occupations with effective institutional barriers include 'Lawyers and Quebec Notaries', 'Physicians and Surgeons', 'Electricians (except Industrial and Power System)' and 'Physiotherapists'.

- **0.5 (for a partially effective barrier)**
  - Provincial/territorial legislation (for trades) is voluntary in most provinces.
  - It is possible to work in the occupation under supervision without professional certification.
  - Certification with a professional association is not mandatory and/or is not required by all employers.
  - Certification or experience is required for some occupations but not all occupations in the NOC unit group (e.g. 'Mathematicians, Statisticians and Actuaries', 'Forestry Technologists and Technicians', and 'Electronic Service Technicians').

  Examples of occupations with partially effective barriers include 'Engineers', 'Forestry Professionals', 'Heavy Duty Equipment Mechanics', and 'Architectural Technologists and Technicians'.

- **1 (for no effective barrier)**
  - There is no restriction to entry (no requirement for certification or previous experience).
  - Occupational requirements are based on qualifications (i.e. education or training) but not on certification.
  - There may be apprenticeship training available; but certification is voluntary in all provinces and territories.

Examples of occupations with no effective barriers include 'Graphic Designers and Illustrating Artists', 'Retail and Wholesale Buyers', 'Library and Archive Technicians and Assistants', 'Journalists' and 'Chemists'.

4.3 Informal occupational barriers

4.3.1 Types of informal occupational barriers

On the surface, the requirements for entry to a regulated occupation, such as completing the qualifying examinations specified by the regulatory body, are straightforward and objective. However, informal barriers may make it difficult or impossible for new immigrants to satisfy these requirements. For example, new immigrants may find it difficult to successfully complete the qualifying examinations if they lack some of the skills and knowledge that can only be developed through an education or training program or work experience in Canada. Foreign-trained nurses sometimes report that they have difficulty qualifying for a licence in Canada because the practices and terminology are different from those in the countries in which they qualified. But they have few opportunities to develop an understanding of the practices and terminology in Canada before they take the qualifying examinations; as a result, the only option open to many is to start at the beginning and take an education and training program in Canada.

Informal occupational barriers may arise for other reasons. For example, determining the educational equivalency or the language proficiency of new immigrants is usually a subjective process, and this may constitute an informal occupational barrier for new immigrants. Common standards for assessing the qualifications and credentials of foreign-trained individuals have not been developed in Canada, so that the various regulatory bodies usually carry out their own assessments. As a result, the educational equivalency or language proficiency of new immigrants is likely to vary among regulatory bodies. Moreover, regulators may be more familiar with the education and training systems in some countries than in others, so that they may treat the qualifications of new immigrants from different countries quite differently.

Since employers are responsible for making job offers to prospective employees, they may also play a critical role in imposing informal occupational barriers for new immigrants. Many employers might not be willing to employ new immigrants because of the risk that their skills and knowledge or language proficiency would not be satisfactory. Thus many new immigrants may not be able to obtain the Canadian work experience usually required for certification or licensing in some occupations.

Because employers have some flexibility in the implementation of occupational barriers, barriers may vary with labour market conditions, at different points in time and in different parts of the country. For example, in a tight labour market when the demand for some occupations is high, employers would tend to lower their standards for entry to those occupations. Similarly, in regions with a relatively low labour supply for occupations in high demand, employers would tend to lower their standards to increase recruitment in those occupations.

The flexibility that employers have in implementing occupational barriers will of course depend on the extent of regulation in the occupation. Employers will generally have little flexibility in occupations that are highly regulated, and especially in occupations that are regulated for health and safety reasons (such as 'Registered Nurses' and 'Air Traffic Controllers'). But employers will generally have considerable flexibility in occupations in which barriers are only partially effective (such as 'Financial Auditors and Accountants'). Employers may also impose occupational barriers in occupations that are not regulated, and hence for which there are no institutional barriers (such as, 'Chemists' and 'Police Officers [Except Commissioned]').

New immigrants may face informal occupational barriers for a number of other reasons. For example, they may be poorly informed about the availability of labour market information and the methods they can use for accessing it: they may therefore have little success in learning about job opportunities in which they can use their skills and knowledge. New immigrants often also lack the contacts in Canada (such as old school friends and relatives) that are sometimes so helpful in getting jobs.

Some information on informal barriers is available in a survey carried out by the Access to Professions and Trades Unit, Ministry of Training, Colleges and Universities, Ontario (see the presentation by Michelle Goldberg at the Fourth National Metropolis Conference).

4.3.2 Outline of the analysis

Although informal barriers are not often specified or documented, empirical analysis may be useful in identifying them. However, highly detailed and extensive data are required to identify informal occupational barriers. The data required include, for example, the occupations of immigrants immediately before and after entering Canada, the educational attainment of immigrants in terms of level of study and field of study, the content and characteristics of the education and training in the country of out-migration, age at immigration, year of immigration, and labour market conditions in Canada. Comparable data for non-immigrants would also be necessary to standardize for the effects of labour market conditions in Canada.

Such detailed data are not available in Canada so that we could not carry out analysis along the above lines. As an alternative, we used 1996 Census data to compare the occupations of immigrants and non-immigrants with similar educational qualifications and with similar characteristics such as age. The assumption in this approach is that standardization for the qualifications and characteristics of immigrants and non-immigrants would eliminate differences due to institutional occupational barriers, so that any residual differences could therefore be attributed to informal barriers.

There are many limitations in this approach. One important limitation is that census occupation data are based on the jobs of immigrants in the census year (and hence after immigrants have lived in Canada for varying periods), rather than on the jobs that immigrants found when they entered Canada. Thus the informal barriers that can be identified using census data do not reflect the barriers new immigrants face upon entering Canada, but the barriers that still exist after they have lived in this country for some time. They therefore differ from institutional barriers we identified above, which reflect the

barriers new immigrants face on entering Canada. This difference will be relatively unimportant for the occupations with highly effective institutional barriers in the Model, since they will affect the index of employment opportunities generated by the Model. However, the difference is likely to be important for occupations in which the institutional barriers are partially effective or not effective at all, since some new immigrants would have had sufficient time to overcome some of those barriers. It follows that our approach will tend to *underestimate* the effects of informal barriers in occupations with institutional barriers that are partly effective or not effective at all.

Another limitation is that since our approach ignores the effects of factors such as the country of education and age at immigration to Canada (because of the lack of appropriate data), it can only provide a rough indication of the existence of informal barriers. It follows that the results need to be interpreted with care.

Other limitations in the empirical analysis should also be borne in mind. For example, even though we used census data for our analysis, the number of immigrants classified simultaneously by occupation, by qualification and by other characteristics such as age and gender, would be far too small for meaningful statistical analysis. We therefore ignored gender in our analysis: this is likely to conceal some of the differences between immigrants and non-immigrants. An alternative (suggested by one of the referees for this Report) would be to pool the data from, say, the 1991 Census and the 1996 Census to provide a larger sample. This would be an interesting approach; but a number of technical problems (such as correcting for differences in economic conditions in the two census years) would need to be resolved.

We used field of study as a basis for identifying the occupations for which immigrants are qualified. In the first stage of our analysis, we selected only occupations in which at least 50% of workers had completed postsecondary education: we assumed that employers would have no field of study preferences in occupations in which less than 50% of workers had completed postsecondary education. In the second stage of our analysis, we selected the most important field of study (in percentage terms) for each occupation; we then compared the percentage of immigrants and non-immigrants qualified in the given field of study and working in the corresponding occupation. A relatively large difference is interpreted as evidence of the likely existence of a barrier.

4.3.3 Data and results

The data we used for the analysis are drawn from a special tabulation from the 1996 Census, showing the experienced labour force 25-34 years old for immigrants and non-immigrants, by detailed occupation and by detailed field of study. The age group 25-34 years was selected for analysis since this group would include only more recent labour market entrants with some labour market experience.

We initially tried to use data on field of study classified at the occupation unit group (4-digit) level in the NOC, but the numbers in some cells were too small for us to identify occupational barriers. We therefore used the occupation minor groups (3-digit) for field of study as the unit of observation for the analysis. This level of aggregation may therefore conceal some of the relationships that exist for detailed occupation groups.

In order to identify the most important field of study for each occupation, we first selected all fields of study within an occupation with 25% or more of the workers in the occupation. We also restricted our analysis to occupations with over 100 immigrant and 500 non-immigrant workers in the selected field of study in order to ensure that the numbers would be large enough to provide reliable results. The occupations that could be included in this analysis (51) are shown together with the results of the analysis in Appendix VI. Further details are available in a report *Identification of Barriers to Occupational Entry: Quantitative Methods Using Census Data*, prepared by Daniel Boothby.

There were several occupations in which there was more than one field of study with more than 25% of graduates. In all of these except one, we were able to select a single field of study (the one with the highest proportion in the occupation) as the most representative field of study: typically this was also the field of study with the largest number in the occupation. For example, there were several fields of study in which over 25% of graduates work as 'Secondary School Teachers': but secondary school teaching is the field with the highest proportion in the occupation.

The only exception was for the occupation 'Medical Radiation Technologists'. The data show that a high percentage of graduates in four different fields of study (radiology, radiological technology, x-ray/medical technology [radiography and x-ray/radiotherapy], and nuclear medicine) worked in this occupation. These fields of study are closely related to the occupation; however, in all four cases the data show that that there are differences between immigrants and non-immigrants, thus suggesting the existence of an occupational barrier.

Over 25% of graduates in three specific fields of study worked in each of two distinct occupations: medical laboratory technology, computer science, and nursing assistant. In the case of medical laboratory technology we compared the percentage of Canadian-born and immigrant graduates in the corresponding occupations ('Medical Laboratory Technologists and Pathology Assistants', and 'Medical Laboratory Technicians'): we concluded that there is evidence of an occupational barrier. For computer science we also compared the percentage of Canadian-born and immigrant graduates in the corresponding occupations ('Computer Systems Analysts' and 'Computer Programmers'); in this case, we concluded that there is no evidence of an occupational barrier.

The case of 'Registered Nursing Assistant' is quite different. In this case, discrepancies exist between the coding of the occupation and field of study in the census, and the legal and regulatory relationship between the occupation and field of study. Thus census data may not provide a reliable basis for identifying barriers in this case. The data show that for both Canadian-born and immigrant graduates in this field of study, the largest occupation of employment was 'Registered Nurse'; and the second largest occupation was 'Registered Nursing Assistant'. We therefore could not conclude that these data provide evidence of a barrier for 'Registered Nursing Assistant'.

After identifying a specific field of study (or fields of study) associated with each occupation, we calculated the percentage of immigrant and non-immigrant graduates in the specific field of study working in the occupation (see Appendix VI). As a criterion, we arbitrarily assumed that a difference of at least 10 percentage points between the figures for immigrants and non-immigrants could be taken as evidence of a barrier. In the

case of 'Medical Radiation Technologists', this was the case for the four specific fields of study identified above.

The criterion of 10 percentage points has no particular statistical significance: we chose it because it seemed a reasonable criterion for roughly identifying the existence of a barrier. As it turns out, the criterion was not critical since the difference was actually substantially greater than 10 percentage points in most cases in which the criterion suggested a barrier.

As noted above, census data do not allow us to distinguish between immigrants who received their highest education in Canada and those who received it before entering Canada. It follows that some immigrants included in the analysis would have received their highest education in Canada; this would mean that in the method we use we would tend *underestimate* the differences between immigrants and non-immigrants. This is particularly important since (as one of the referees of this Report has pointed out) some studies have suggested that the labour market outcomes for immigrants who received their highest education in Canada and outside Canada are quite different. Although census data do not indicate the country of education of immigrants, some inferences can probably be drawn from census data. Further research on this possibility would probably be worthwhile.

The empirical analysis provides confirmation that institutional barriers exist for some individual occupations within each of the following groups: teaching, engineering, health professions, and the construction trades. But it also suggests that informal barriers exist for some occupations with no formal barrier (such as 'Police Officers' and 'Fire Fighters').

The results of our empirical analysis need to be interpreted with care for a number of reasons:

- The existence of an informal occupational barrier does not necessarily imply that there is discrimination against immigrants. Barriers may result from differences in the type of training associated with the field of study for immigrants and non-immigrants.

- Part of the difference in the proportion of immigrants and non-immigrants in an occupation may be due to differences in level of study. However, because of the small cell sizes, we could not control for level of study in our comparisons.

- The informal occupational barriers we identified do not seem to represent an absolute obstacle to the employment of immigrants. In all our comparisons, the occupation with the largest proportion of Canadian-born graduates from a specific field of study was the same as that for immigrants from the same field of study.

- Although the data suggest that there are no barriers in some occupations, we cannot be sure that this is indeed the case. For example, the data suggest that there is no barrier for 'Mechanical Engineers'; but they suggest that there are barriers for other engineers (such as 'Civil Engineers'). Why should there be a difference between the two?

  This difference may occur for different reasons. Individuals without the appropriate professional registration may work in engineering occupations as classified in the NOC; thus the difference could occur if the proportion of those working as 'Mechanical Engineers' in the census, but without the appropriate professional registration, were higher

than the proportion for other engineers. One of the referees of this Report suggested other reasons for the difference: one of these is that 'Civil Engineers' often need to sign building plans and similar documents, so that it is probably more likely that employers will require that such engineers be members of the professional association (which would include a test of Canadian legal knowledge).

Another possibility is that persons trained in mechanical engineering may (unlike those in other engineering fields) work in several engineering occupations: this would weaken the observed link between field of study and occupation. This seems reasonably likely since the data show that only 31% of Canadian-born mechanical engineering graduates worked as 'Mechanical Engineers'.

4.3.4 Some conclusions about identifying informal occupational barriers

What can we conclude from our attempt to identify informal occupational barriers using census data?

An important conclusion is that our approach seems to provide a reasonable basis for identifying informal occupational barriers. However, as we argue above, our results provide only a rough indicator of the existence of informal occupational barriers. More detailed analysis using pooled census data and using more extensive statistical analysis will likely yield more reliable results: further research along these lines should therefore be encouraged.

Another important conclusion is that census occupation data are likely to yield *underestimates* of the existence of informal occupational barriers. This is because census data are based on the jobs of immigrants in the census year and hence after immigrants have lived in Canada for varying periods of time. Thus some new immigrants, who faced occupational barriers when they entered Canada, would have been able to overcome those barriers by census year. The extent to which they would have been able to overcome those barriers would depend on a variety factors such as: the particular occupation in which new immigrants tried to find jobs (and hence the effectiveness of the institutional barriers in the occupation); labour market conditions in the region in which new immigrants settled; and the period of time between immigration and census year.

This suggests that, although census data provide a reasonable basis for identifying informal occupational barriers, the estimates can only be approximate. A more promising approach would be to use data on the occupations of new immigrants before and after they entered Canada.

4.4 On integrating the formal and informal occupational barriers

In summary, occupational barriers are entry requirements that seek to control access to employment in an occupation. They may be formal or institutional (based on certification, licensing, or membership in an association), or informal (based on factors such as recognition of the education and training obtained outside Canada, language proficiency and work experience in Canada).

New immigrants cannot immediately enter occupations in which there are barriers to entry in Canada. Thus new immigrants may not be able to immediately enter the occupations for which they were educated and trained outside Canada.

We were able to determine if institutional barriers exist for the 200 occupations in the Model through analysis of the documentation available. However, informal occupational barriers cannot easily be identified since they are not documented. We tried to identify informal occupational barriers by comparing the occupations of immigrants and non-immigrants using 1996 Census data; but we could only make such comparisons for 51 occupations.

Although the formal and informal occupational barriers are conceptually somewhat different, we believe that it is useful to integrate them in the Model since the value of the Derived Index would provide the best summary indication of the employment opportunities of new immigrants. We have therefore integrated them for the discussion of the Model in this Report. However, we have included the values for both the formal and informal barriers in the relevant spreadsheet for the Model. It would therefore be easy for users to derive the relevant Derived Index based only on the formal barriers.

In order to integrate the formal and informal barriers, we first compared the formal and informal barriers for the 51 occupations for which we identified informal barriers: the value of the barrier was different in 28 of these. We next re-examined the information we used to derive the institutional barriers for those 28 occupations, and we selected the value of the barrier that would best reflect the employment opportunities for new immigrants in these occupations. These values are shown in Appendix VII: they are used in the discussion of the Model in Chapter V.

We made minor adjustments to the institutional barriers for some occupations on the basis of this comparison. However, we made major adjustments for two occupations – Police Officers (except Commissioned) and Fire Fighters. In both of these, we found no evidence of an institutional barrier, suggesting that these are relatively open occupations; but in each case the empirical analysis strongly suggested that there is an effective barrier.

Our empirical results were confirmed in informal discussions with police authorities. New immigrants with police training in other countries cannot usually enter the occupation directly; and those with the required educational qualifications must complete the required training before they can qualify as a 'Police Officer'. We have therefore used a barrier of 0 for this occupation in the Model.

5. Discussion of the results of the Model

5.1 The Derived Index

The data in Table V.1 show the Derived Index for the 20 occupations with the highest values (the values of the Derived Index for the 200 occupations in the Model are included in Appendix II).

Table V.1
20 occupations with the highest values of the Derived Index

Occupation (NOC 4-digit)	Derived Index
2147 Computer engineers	0.000636
1111 Financial auditors and accountants	0.000528
2162 Computer systems analysts	0.000494
1221 Administrative officers	0.000456
1222 Executive assistants	0.000456
2161 Mathematicians, statisticians and actuaries	0.000445
2163 Computer programmers	0.000416
1226 Conference and event planners	0.000300
2133 Electrical and electronics engineers	0.000220
1243 Medical secretaries	0.000192
1242 Legal secretaries	0.000192
1241 Secretaries (except legal and medical)	0.000170
1233 Insurance adjusters and claims examiners	0.000168
6231 Insurance agents and brokers	0.000168
1234 Insurance underwriters	0.000156
2241 Electrical and electronics engineering technologists and technicians	0.000154
4162 Economists and economic policy researchers and analysts	0.000154
6232 Real estate agents and salespersons	0.000144
4152 Social workers	0.000131
2131 Civil engineers	0.000114

The Derived Index is highest for 'Computer Engineers'; and it is also relatively high for related occupations: 'Computer Systems Analysts'; 'Mathematicians, Statisticians and Actuaries'; 'Computer Programmers'; 'Electrical and Electronics Engineers'; and 'Electrical and Electronics Engineering Technologists and Technicians'. These results are not too surprising since the skills and knowledge in these occupations are transferable to other occupations; and there are no barriers, or only partially effective barriers, in all of these occupations.

However, the Index for some of the other occupations in Table V.1 may seem surprising. For example, it may seem surprising that the values of the Index for occupations such as 'Administrative Officers' and 'Real Estate Agents and Salespersons' are so high. However, these values are consistent with the structure of the Model: the value of the Index depends not only on the values of the factors for the given occupation (skills transferability, occupational barriers, wages, job prospects and employment level), but also on the values of the factors

for the particular occupations to which transfer is possible. Thus the Index for a particular occupation will tend to be large not only if one of the factors for the given occupation is large, but also if the factors for the other occupations to which transfer is possible, is large.

The data in Table V.2 show that there are 26 occupations with a Derived Index of zero.

Table V.2
Occupations with zero value for the Derived Index

1228 Immigration, unemployment insurance and revenue officers
2244 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors
2272 Air traffic control occupations
2273 Deck officers, water transport
2274 Engineer officers, water transport
3113 Dentists
3122 Chiropractors
3143 Occupational therapists
3151 Head nurses and supervisors
3215 Medical radiation technologists
3216 Medical sonographers
3218 Electroencephalographic and other diagnostic technologists n.e.c.
3221 Denturists
3222 Dental hygienists and dental therapists
3233 Registered nursing assistants
4112 Lawyers and Quebec notaries
4168 Program officers unique to government
6261 Police officers (except commissioned)
6262 Fire-fighters
7241 Electricians (except industrial and power system)
7251 Plumbers
7261 Sheet metal workers
7313 Refrigeration and air conditioning mechanics
7371 Crane operators
8261 Fishing masters and officers
8262 Fishing vessel skippers and fishermen/women

The list includes occupations such as: 'Air Traffic Control Occupations'; 'Dentists'; 'Head Nurses and Supervisors'; 'Lawyers and Quebec Notaries'; and 'Plumbers'. These are all occupations with an effective barrier to entry (i.e. the value of the barrier is zero).

5.2 Some examples of the effects of the factors on the Derived Index

In this section we provide some examples that may help to provide a better understanding of how the Model works. The Derived Index for three occupations are examined:

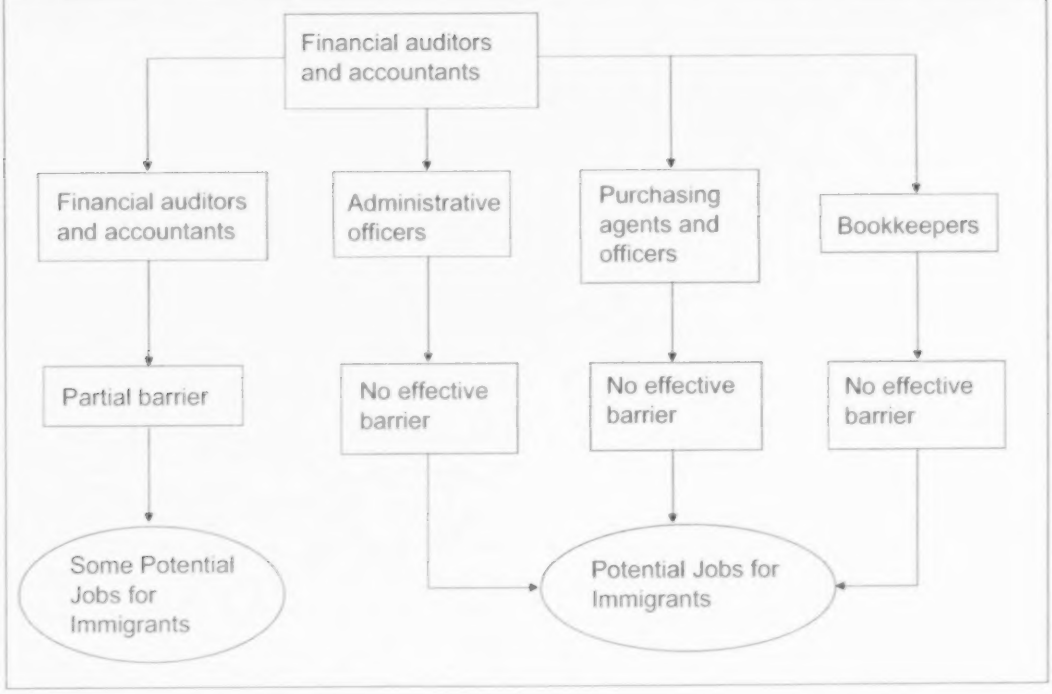
- Financial Auditors and Accountants (the Derived Index for this occupation is 0.000528, and it is ranked 2nd in terms of the size of the Index for the 200 occupations);
- General Practitioners and Family Physicians (the Derived Index for this occupation is 0.000055, and it is ranked fifty-fifth in terms of the size of the Index for the 200 occupations); and
- Meteorologists (the Derived Index for this occupation is 0.000002, and it is ranked 162nd in terms of the size of the Index for the 200 occupations).

These three examples therefore cover a range of values for the Derived Index for the various occupations.

5.2.1 Financial Auditors and Accountants

Chart V.1 illustrates how the Model works for 'Financial Auditors and Accountants'.

Chart V.1
An example of the effects of skills transferability and barriers on potential jobs for immigrants: Financial Auditors and Accountants



As the chart shows, there is a partial barrier in the occupation 'Financial Auditors and Accountants'. Thus, some new immigrants educated in a foreign country, will not be able to enter the occupation immediately on immigrating to Canada. This will therefore tend to limit the employment opportunities in the occupation for qualified new immigrants. Thus, although the values of the other factors for this occupation (earnings, job growth and employment) are relatively large (see Table V.3), they will have a somewhat reduced effect on the Derived Index because of the partial barrier in the occupation.

The skills and knowledge in 'Financial Auditors and Accountants' are transferable to three other occupations: 'Administrative Officers', 'Purchasing Agents and Officers', and 'Bookkeepers'. There are no barriers in any of these occupations, so that qualified new immigrants will also be able to work in these three occupations.

Table V.3
Indices for occupations in which foreign educated 'Financial Auditors and Accountants' can work in Canada

Occupation	Earnings	Job Growth	Employment
Financial Auditors and Accountants	0.34	0.67	0.21
Administrative Officers	0.28	1.0	0.18
Purchasing Agents and Officers	0.32	1.0	0.03
Bookkeepers	0.16	0.67	0.18

The values of the indices of earnings, job prospects and employment in these three occupations are also shown in Table V.3. These indices are almost all relatively high, so that they will tend to raise the employment opportunities for new immigrants qualified to work as 'Financial Auditors and Accountants'. It follows that the Derived Index for the occupation will tend to be high because of the effects of these factors in the occupations to which skills transferability is possible.

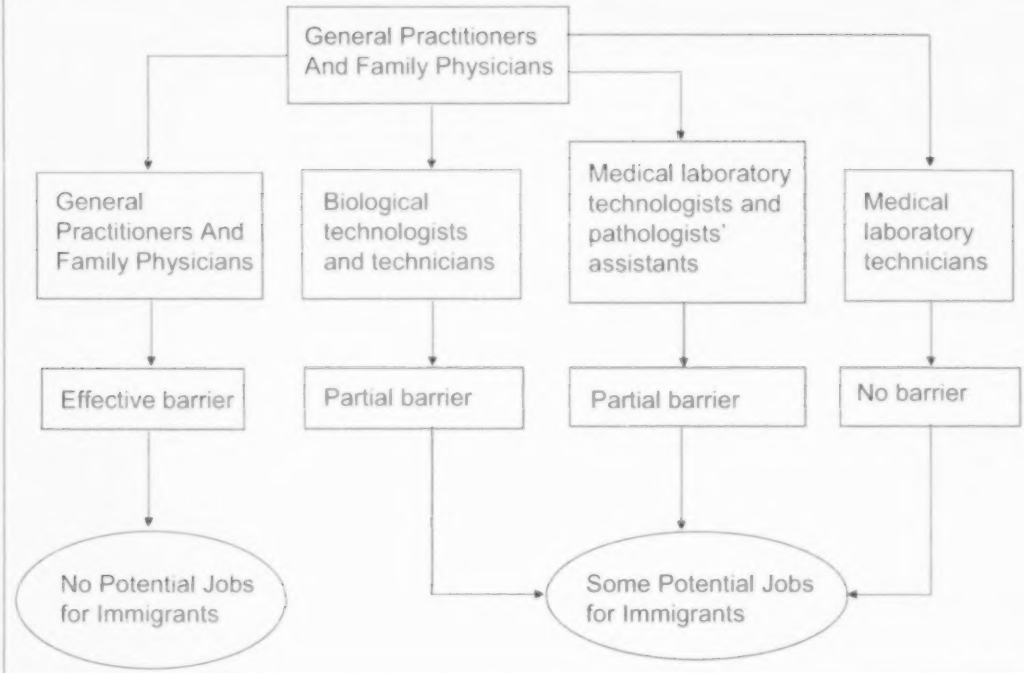
5.2.2 General Practitioners and Family Physicians

Chart V.2 illustrates how the Model works for 'General Practitioners and Family Physicians'.

The chart shows that new immigrants qualified to work as 'General Practitioners and Family Physicians' in a foreign country, cannot immediately work in the same occupation in Canada. There is an effective barrier in the occupation, and new immigrants must complete the qualifying examinations of the Medical Council of Canada and an internship program before being considered for employment in the occupation. It follows that there are no potential jobs in the occupation for new immigrants when they enter Canada.

However, the skills and knowledge required in this occupation are also relevant in three other occupations: 'Biological Technologists and Technicians', 'Medical Laboratory Technologists and Pathologists' Assistants', and 'Medical Laboratory Technicians'. There is a partially effective barrier in two of these occupations, but no barrier in the third: it follows there are likely to be some potential jobs in these occupations for new immigrants qualified to work as 'General Practitioners and Family Physicians'.

Chart V.2
An example of the effects of skills transferability and barriers on potential jobs for immigrants: General Practitioners and Family Physicians



The Derived Index for 'General Practitioners and Family Physicians' will therefore be based not on the potential employment opportunities in that occupation, but instead on the potential employment opportunities in the three other occupations to which skills transfer is potentially possible.

Table V.4
Indices for occupations in which foreign educated/trained 'General Practitioners and Family Physicians' can work

Occupation	Barrier	Earnings	Job Prospects	Employment
Biological technologists and technicians	0.5	0.21	0.33	0.02
Medical laboratory technologists and pathologists' assistants	0.5	0.28	1.0	0.03
Medical laboratory technicians	1.0	0.23	0.67	0.04

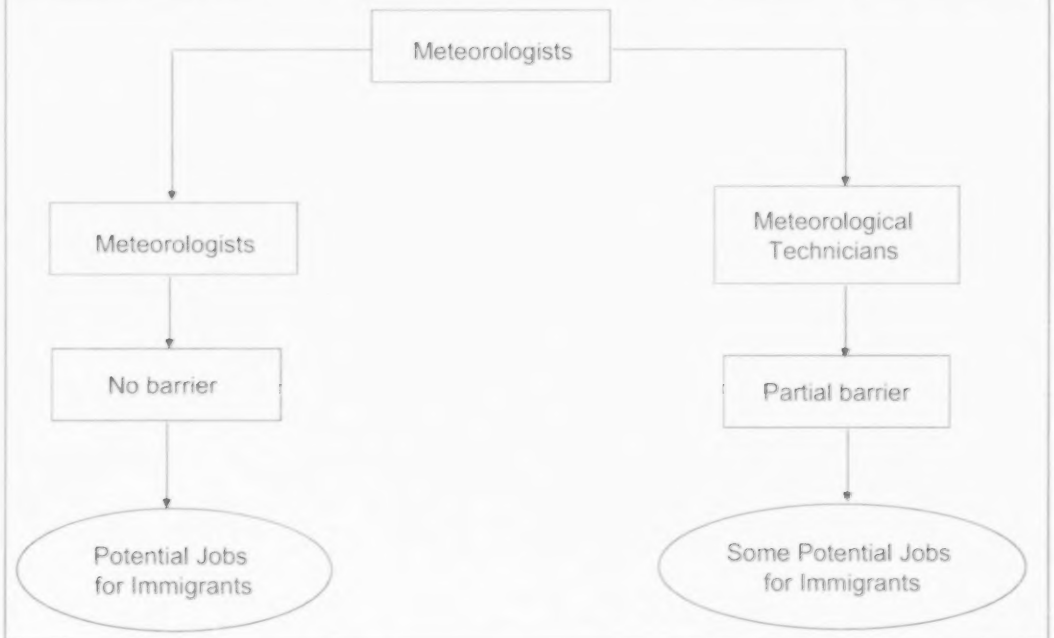
The values of the indices for the barriers, for earnings, for job prospects and for employment in the three occupations are shown in Table V.4. Some of these are relatively large, so that the Index for 'General Practitioners and Family Physicians' would be expected to be moderately high.

5.2.3 Meteorologists

Chart V.3 provides an illustration of how the Model works for 'Meteorologists'.

The chart shows that there is no barrier to entry to the occupation, so that new immigrants, who are qualified to work as 'Meteorologists' in a foreign country, can immediately work in the same occupation in Canada. In addition, the skills and knowledge in the occupation are transferable to 'Meteorological Technicians', so that there may also be some potential jobs in that occupation.

Chart V.3
An example of the effects of skills transferability and barriers on potential jobs for immigrants: Meteorologists



The values of the indices for the barriers, for earnings, for job prospects and for employment are shown in Table V.5 for 'Meteorologists' and for 'Meteorological Technicians'. Although the index for earnings in both occupations is moderate, the index for employment is very small in both: it follows that the new employment opportunities in both occupations are likely to be small. In addition, the job prospects for 'Meteorologists' are poor (an index of 0.33), while those for 'Meteorological Technicians' are only fair (an index of 0.67). It follows that the Index for 'Meteorologists' is likely to be small.

Table V.5
Indices for occupations in which foreign educated 'Meteorologists' can work in Canada

Occupation	Barrier	Earnings	Job Prospects	Employment
Meteorologists	1.0	0.41	0.33	0.00
Meteorological Technicians	0.5	0.31	0.67	0.00

5.3 Simplifying the interpretation of the results

The values of the Derived Index for 24 selected occupations are shown in Table V.6. These results are used to demonstrate how the interpretation of the results can be simplified.

Table V.6
Derived Index for selected occupations

NOC Occupation (4-digit)	Value of Derived Index	Rank of Derived Index	Rank of group
1111 Financial auditors and accountants	0.000528	2	1
1221 Administrative officers	0.000456	4	1
1228 Immigration, unemployment insurance and revenue officers	0.000000	175	10
2113 Geologists, geochemists and geophysicists	0.000013	108	6
2133 Electrical and electronics engineers	0.000220	9	1
2163 Computer programmers	0.000416	7	1
2211 Applied chemical technologists and technicians	0.000047	64	4
2244 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors	0.000000	175	10
3112 General practitioners and family physicians	0.000055	55	3
3143 Occupational therapists	0.000000	175	10
3152 Registered nurses	0.000068	42	3
3211 Medical laboratory technologists and pathologists' assistants	0.000052	60	3
3217 Cardiology Technologies	0.000001	165	9
4112 Lawyers and Quebec notaries	0.000000	175	10
4141 Secondary school teachers	0.000013	103	6
5111 Librarians	0.000032	77	4
5221 Photographers	0.000011	111	6
6231 Insurance agents and brokers	0.000168	14	1
6261 Police officers (except commissioned)	0.000000	175	10
7232 Tool and die makers	0.000007	121	7
7295 Floor covering installers	0.000006	132	7
7332 Electric appliance servicers and repairers	0.000005	137	7
7372 Drillers & Blasters	0.000002	160	8
8261 Fishing masters and officers	0.000000	175	10

The entries in Column (2) in Table V.6 show the actual values of the Derived Index for the selected occupations. These values are somewhat arbitrary, since the values of some of the factors (e.g. for a partial barrier) are also somewhat arbitrary. Moreover, each factor carries the same weight in the Index. It follows that the values of the Index may convey an erroneous impression of the extent of the difference between occupations.

The rank of the Index may therefore provide a more useful basis for interpreting the results and for policy development. The rank (based on descending order of the size of the Derived Index) is shown for selected occupations in Column (3) in Table V.6: note that all occupations with a Derived Index of 0 have the same rank (175). The data show that the

Derived Index for 'Financial Auditors and Accountants' is the second highest for all the occupations in Appendix II. By contrast, the Index for 'Secondary School Teachers' is ranked 103rd in the list of 200 occupations: this is slightly lower than half of all the occupations in the Model.

Another possibility for simplifying the interpretation of the results even more is to arrange the occupations in groups based on the size of the Derived Index. As an illustration, we tried to arrange the occupations in 10 groups of 20, but this was not possible since there are 26 occupations in the lowest group (with a Derived Index of 0). We therefore used included 20 occupations in each of the first 8 groups, 14 occupations in the 9th group, and 26 occupations in the 10th group. We then ranked the occupations in these groups from 1 to 10. The ranks of the groups in which the selected occupations appear are shown in Column (4) in Table V.6. On this basis, the Derived Index for 'Financial Auditors and Accountants' falls in the highest group for all the occupations in Appendix II, while that for 'Secondary School Teachers' falls in the 6th group.

These results suggest that using the ranking of groups of occupations, rather than the actual ranking of the values of the Derived Index, may be sufficiently useful for interpreting the results of the Model, and for their use in policy development. In fact, the correlation coefficient between ranking of the values of the Derived index and ranking of groups of occupations is 0.993, thus confirming the close relationship between the two methods of ranking.

5.4 Some experiments with the Model

As noted above, the value of the Derived Index for an occupation depends, not only on the values of the factors for the given occupation (skills transferability, barrier, wages, job prospects and employment level), but also on the values for the factors in the particular occupations to which transfer is possible. But how important are the effects of each of these factors on the Derived Index? We addressed this question by calculating the value of the Derived Index while standardizing for differences by occupation in the values of each factor. For example, we calculated the values for the Derived Index assuming that, for each occupation, there is no skills transferability to any other occupation: the values of the Derived Index calculated in this way can then be compared with those for the Index for the full Model (which we refer to as the 'base' Index) to provide an indication of how skills transferability affects the Derived Index in different occupations. The results of these experiments are shown in Appendix III for each occupation in the Model.

In order to assess the overall effect of each factor in the Model, we calculated the correlation coefficient between the base Index and the Index based on standardization with respect to a given factor. If the factor had a major impact on the base Index, the correlation coefficient would be expected to be relatively low; by contrast, if the factor had a minor impact on the base Index, the correlation coefficient would be expected to be relatively high.

Table V.7
Correlation coefficient between base Derived Index and Derived Index based on standardization with respect to different factors

Index based on no skills transferability	Index based on no barriers	Index based on same wage in each occupation	Index based on good job prospects in each occupation	Index based on same employment in each occupation
0.626	0.672	0.966	0.940	0.758

These correlation coefficients are shown in Table V.7. The correlation coefficients for skills transferability and barriers are relatively low: this suggests that these two factors have the most important effect (of the five factors in the Model) on the Derived Index. Somewhat surprisingly, wages and job prospects have little effect on the Derived Index.

It is also interesting to look at the results of the experiments for selected occupations (Table V.8). Note that the values of the Derived Index in the table have been multiplied by 1000 to simplify the presentation.

Table V.8
Derived Index (multiplied by 1000) in selected occupations while standardizing for differences by occupation in the values of each factor

NOC Occupation (4-digit)	Base Model	No skills transfer-ability	No barriers	Same wage in each occupation	Good job prospects in each occupation	Same employment in each occupation
1111 Financial auditors and accountants	0.528	0.120	0.648	2.046	0.637	4.108
1221 Administrative officers	0.456	0.256	0.456	1.975	0.795	3.112
1241 Secretaries (except legal and medical)	0.170	0.170	0.170	0.952	0.509	0.297
2113 Geologists, geochemists and geophysicists	0.013	0.005	0.025	0.037	0.027	0.873
2133 Electrical and electronics engineers	0.220	0.062	0.440	0.716	0.242	3.513
2163 Computer programmers	0.416	0.122	0.416	1.216	0.478	2.819
2211 Applied chemical technologists and technicians	0.047	0.018	0.064	0.193	0.070	1.207
2224 Conservation and fishery officers	0.002	0.002	0.005	0.011	0.007	0.191
3112 General practitioners and family physicians	0.055	0.0	0.351	0.225	0.076	1.641
3143 Occupational therapists	0.0	0.0	0.011	0.0	0.0	0.0
3152 Registered nurses	0.068	0.0	0.637	0.348	0.103	1.069
3211 Medical laboratory technologists and pathologists' assistants	0.052	0.023	0.075	0.210	0.067	1.464
3217 Cardiology Technologies	0.001	0.001	0.003	0.006	0.001	0.574
4112 Lawyers and Quebec notaries	0.0	0.0	0.314	0.0	0.0	0.0
4141 Secondary school teachers	0.013	0.0	0.769	0.057	0.020	0.382
5111 Librarians	0.032	0.018	0.032	0.158	0.048	1.387
5221 Photographers	0.011	0.011	0.011	0.067	0.016	0.550
6231 Insurance agents and brokers	0.168	0.142	0.194	0.577	0.168	2.202
6261 Police officers (except commissioned)	0.0	0.0	0.210	0.0	0.0	0.0

Table V.8
Derived Index (multiplied by 1000)* in selected occupations while standardizing for differences by occupation in the values of each factor

7232 Tool and die makers	0.007	0.007	0.015	0.022	0.022	0.280
7295 Floor covering installers	0.006	0.006	0.013	0.037	0.009	0.285
7332 Electric appliance servicers and repairers	0.005	0.005	0.009	0.024	0.007	0.314
7372 Drillers & Blasters	0.002	0.002	0.002	0.008	0.007	0.469
8261 Fishing masters and officers	0.0	0.0	0.018	0.0	0.0	0.0

* Note: The Derived Index in this table has been multiplied by 1000 in order to simplify the presentation in the table.

Consider, first of all, the coefficients of occupations with a Derived Index of 0 in the base Model. As noted above, there are 26 such occupations (5 of these are included in Table V.8): these are occupations with highly effective barriers and with no skills transferability to other occupations. Standardization for differences in skills transferability among occupations increases the number of occupations with a Derived Index of 0 to 40 (see Appendix III). The data in Column (3) in Table V.8 show that in our list of selected occupations, there are now three additional occupations for which the Index has become 0: 'General Practitioners and Family Physicians', 'Registered Nurses', and 'Secondary School Teachers'. These are all occupations with highly effective barriers and some skills transferability: thus the results of this experiment indicate that skills transferability has a significant effect on the Derived Index for occupations with highly effective barriers.

Barriers also clearly have a significant impact on the Derived Index for an occupation. For example, standardization for differences in barriers by occupation dramatically increases the Index for 'Registered Nurses' (Column [4] in Table V.8). It follows that barriers have a major impact on the Derived Index.

The results of the experiments for 'Occupational Therapists' are also interesting. The barrier in this occupation is highly effective, and there is no skills transferability to any other occupation in the Model. Thus standardizing for differences in skills transferability and for the other factors makes no difference in the Index for this occupation (as it does for 'Registered Nurses'). Moreover, since the occupation is very small, removing the effects of the barrier makes little difference to the Derived Index.

Although there is no barrier for 'Photographers', the results of the experiments are similar in some respects to those for 'Occupational Therapists': here again standardizing for differences in skills transferability by occupation makes no difference in the Index for this occupation. However, since there is no barrier in the occupation, the size of the Derived Index depends on the values of the other factors for the occupation. This is illustrated by the entries in Column (7) in Table V.7: since the occupation is very small, standardizing for differences in the size of occupations has a considerable impact on the Derived Index for 'Photographers'.

'Computer Programmers' provide a good example of an occupation with a high degree of skills transferability and no occupational barriers. Standardization with respect to skills transferability therefore reduces the Index considerably; but standardization for barriers has no effect on the Index. Standardization for job prospects makes little difference to the Index; but standardization for size of employment has a considerable impact on the Index.

5.5 Effects of using indices of wages and employment of immigrants

The Model described in this Report is based on indices of wages and employment level for the entire population. Our assumption in this approach was that it would be inappropriate to use the wages and employment of immigrants since these would reflect the effects of the labour market for immigrants, and hence would include the effects of occupational barriers (which we were treating separately). However, it was suggested in a meeting of the Technical Experts on the Study that we should examine the effects of the wages and employment of immigrants on the Derived Index.

We therefore conducted another experiment using indices of wages and employment level for immigrants rather for the entire population. The 20 occupations with the highest values of the Derived Index based on immigrant data are compared in Table V.9 with those for the base Model.

Table V.9
20 occupations with the highest values of the Derived Index

Base Model	Using wages and employment for Immigrants
2147 Computer engineers	2147 Computer engineers
1111 Financial auditors and accountants	2162 Computer systems analysts
2162 Computer systems analysts	2161 Mathematicians, statisticians and actuaries
1221 Administrative officers	2163 Computer programmers
1222 Executive assistants	1111 Financial auditors and accountants
2161 Mathematicians, statisticians and actuaries	1221 Administrative officers
2163 Computer programmers	1222 Executive assistants
1226 Conference and event planners	2133 Electrical and electronics engineers
2133 Electrical and electronics engineers	1226 Conference and event planners
1243 Medical secretaries	6232 Real estate agents and salespersons
1242 Legal secretaries	2241 Electrical and electronics engineering technologists and technicians
1241 Secretaries (except legal and medical)	2132 Mechanical engineers
1233 Insurance adjusters and claims examiners	1243 Medical secretaries
6231 Insurance agents and brokers	1242 Legal secretaries
1234 Insurance underwriters	1233 Insurance adjusters and claims examiners
2241 Electrical and electronics engineering technologists and technicians	6231 Insurance agents and brokers
4162 Economists and economic policy researchers and analysts	2141 Industrial and manufacturing engineers
6232 Real estate agents and salespersons	2131 Civil engineers
4152 Social workers	4162 Economists and economic policy researchers and analysts
2131 Civil engineers	1234 Insurance underwriters

These data show that the use of data for immigrants does change the ranking of occupations somewhat. But the changes are generally fairly small (the correlation coefficient between the Index in the two cases is 0.972). As an example, the rank for 'Secretaries (except legal and medical)' falls from 12 to 22. One of the largest changes occurs for 'Secondary School Teachers': the rank falls from 103 to 127. However, this is unlikely to have a significant effect on the development of policy using the Model.

6. Conclusions and suggestions for future work

6.1 Introduction

The model described in this Report provides a basis for examining the effects of a number of factors on the potential employment opportunities of new immigrants in an occupation. The factors included in the Model are the skills transferability between occupations, barriers that affect entry to each occupation, earnings in each occupation, job prospects in each occupation, and the level of employment in each occupation. Experiments with the Model show that skills transferability and occupational barriers are the most important of these factors. The effects of earnings, job prospects, and the level of employment are also important; but they depend on the skills transferability and occupational barriers in the occupation.

The results of the Model may be useful for developing government policy and for providing advice for new immigrants. It seems reasonable, in the short-term, to treat the occupational barriers identified in the Model as being fixed. But does this mean that immigrants in occupations with highly effective barriers should be given lower priority in the immigration selection process? Should immigrants in occupations with highly effective barriers be discouraged from immigrating to Canada? Conversely, should immigrants in occupations with no barriers and high skills transferability be encouraged to immigrate to Canada, and should they be given preference in the immigration selection process? Should governments work, over the long-term, towards removing occupational barriers or at least towards reducing their effectiveness?

These are complex questions, but the Model may be useful in addressing them. In the next section, we suggest a basis for doing so: we also include examples that illustrate how the Model may be useful.

6.2 Using the Model

The discussion that follows is based on a categorization of occupations into four types:

- Occupations with highly effective barriers and *low* skills transferability to other occupations.
- Occupations with highly effective barriers and *high* skills transferability to other occupations.
- Occupations with no barriers or with partly effective barriers and *low* skills transferability to other occupations.
- Occupations with no barriers or with partly effective barriers and *high* skills transferability to other occupations.

6.2.1 Occupations with highly effective barriers and low skills transferability to other occupations

Occupations in this category include: 'Air Traffic Control Occupations', 'Occupational Therapists', 'Lawyers and Quebec Notaries', 'Electricians (except Industrial and Power System)', and 'Plumbers'.

Since the barriers in these occupations are highly effective, most new immigrants in these occupations (who were educated or trained in a foreign country) would not be able to enter the occupation on immigrating to Canada. Moreover, they would not be able to use their skills and knowledge in any other occupation in the Model. This suggests that they would probably be well advised not to consider immigrating to Canada unless they were willing to undertake a retraining program, or to work in an occupation requiring lower skills and knowledge than they possess: the required period of retraining and the likelihood of success would vary by occupation.

It would also seem reasonable that individuals qualified in these occupations (and educated in a foreign country) should be given a low priority in the immigration selection process. Such individuals would not be able to enter the occupation in which they were trained, and they would not be able to use their skills and knowledge in any other occupation in the Model. It follows that they would have no competitive advantages in meeting the needs for skilled workers in Canada.

It is also evident, from a policy perspective, that governments would not be able to use immigration in such occupations as a short-run mechanism for reducing labour shortages. For example, increasing the number of immigrants qualified in a foreign country to work as 'Electricians (except Industrial and Power System)' would not affect the short-run supply in the occupation; such immigrants would need to undertake a retraining program before they could enter the occupation in Canada.

Over the long-term, it would be useful for governments to undertake policies and programs that would encourage regulatory bodies to reassess the requirements that foreign-educated workers must meet in order to obtain a certificate or licence in these occupations. Such policies and programs could be particularly useful in eliminating or reducing informal barriers (such as the lack of recognition of foreign credentials, and the difficulty immigrants have in getting work experience in Canada) that make it even more difficult for new immigrants to meet the requirements for entry to some occupations.

6.2.2 Occupations with highly effective barriers and high skills transferability to other occupations

Occupations in this category include: 'General Practitioners and Family Physicians', 'Pharmacists', 'Registered Nurses', and 'Psychologists'.

Since the barriers in these occupations are highly effective (like those in the previous category), most new immigrants (educated or trained in a foreign country) would not be

able to enter one of these occupations on immigrating to Canada. However, since there is a high degree of skills transferability for these occupations, new immigrants would be able to use their skills and knowledge in other occupations in the Model. Thus, even though they would not be able to enter the occupations in which they were trained, new immigrants in these occupations could find jobs in similar occupations. For example, new immigrants trained as 'Pharmacists' in a foreign country would be able to work in occupations with related skills and knowledge (such as 'Medical Laboratory Technologists and Pathologists' Assistants'). Thus they may be able to use their skills and knowledge, and to do so while undertaking a retraining program in Canada.

It would also seem reasonable that individuals qualified in these occupations (and educated in a foreign country) should be given a low priority in the immigration selection process since they would not be able to enter the occupation on immigrating to Canada. However, since they would be able to use their skills and knowledge in another occupation in the Model, it would make sense that they be given a higher priority than individuals in the occupations in the previous category.

Like the occupations in the previous category, governments would not be able to use immigration as a short-run mechanism for reducing labour shortages in the occupations in this category. For example, increasing the number of immigrants, qualified in a foreign country to work as 'Registered Nurses', could not be used to affect the short-run supply in the occupation, since such immigrants would need to undertake a retraining program before they could enter the occupation in Canada. However, foreign-trained workers in the occupation may be able to use their skills and knowledge while undertaking a retraining program in Canada.

As in the previous category, it would be useful for governments to undertake policies and programs to encourage regulatory bodies to reassess the requirements that foreign-educated workers must meet in order to obtain a certificate or licence in these occupations. Here again, such policies and programs could be particularly useful in eliminating or reducing informal barriers (such as the lack of recognition of foreign credentials, and the difficulty immigrants have in getting work experience in Canada) that make it even more difficult for new immigrants to overcome formal barriers in these occupations.

6.2.3 Occupations with no barriers or with partly effective barriers and low skills transferability to other occupations

Occupations in this category include: 'Secretaries (except Legal and Medical)', 'Meteorologists', 'Medical Laboratory Technicians', 'Education Policy Researchers, Consultants and Program Officers', and 'Tool and Die Makers'.

Since there are no barriers in these occupations or the barriers are only partially effective, some new immigrants (educated and trained in a foreign country) would be able to enter the occupation on immigrating to Canada. At the same time, because of the low degree of skills transferability in these occupations, new immigrants would not be able to use their

skills and knowledge in other occupations in the Model. It follows that new immigrants in occupations in this category would be well advised to pay close attention to economic factors (wages, job prospects and total employment) affecting the relative demand for the occupation in Canada.

For example, the job prospects for 'Meteorologists' in Canada are poor and total employment in the occupation is very small: thus new immigrants trained in this occupation may find it difficult to find a job in the occupation. By contrast, the job prospects for 'Medical Laboratory Technicians' in Canada are fair and total employment in the occupation is considerably larger than that for 'Meteorologists': thus individuals trained as 'Medical Laboratory Technicians' may find it somewhat easier than 'Meteorologists' to find a job in Canada.

Since some new immigrants in the occupations in this category would be able to enter their occupation on immigrating to Canada, it would seem reasonable that they should be given somewhat higher priority in the immigration selection process than those in the two categories above. However, since they would be not able to use their skills and knowledge in another occupation in the Model, it would make sense that economic factors (wages, job prospects and total employment) affecting the relative demand for the occupation in Canada be considered in setting their priority in the selection process.

Unlike the occupations in the two previous categories, governments could use immigration in the occupations in this category as a short-run mechanism for reducing labour shortages. For example, increasing the number of immigrants, qualified in a foreign country to work as 'Tool and Die Makers', could be used to affect the short-run supply in the occupation since such immigrants could enter the occupation on immigrating to Canada.

It would also be useful for governments to undertake policies and programs that would help to eliminate or reduce informal barriers that may make it difficult for new immigrants to find jobs in some of these occupations. Such programs may include, for example, encouraging employers to employ qualified new immigrants, and instituting programs to ensure that new immigrants are well informed about the availability of labour market information and the methods they can use for accessing it.

6.2.4 Occupations with no barriers or with partly effective barriers and high skills transferability to other occupations

Occupations in this category include: 'Financial Auditors and Accountants', 'Chemists', 'Computer Engineers', 'Electrical and Electronics Engineering Technologists and Technicians', 'Social Workers', and 'Journalists'.

Since there are no barriers in these occupations or the barriers are only partially effective, some new immigrants (trained in a foreign country) would be able to enter the occupation on immigrating to Canada. Moreover, since there is a high degree of skills transferability in these occupations, new immigrants would be able to use their skills and knowledge in other occupations in the Model. It follows that new immigrants in occupations in this category are likely to have employment opportunities in other occupations: thus, it would make sense for them to consider economic conditions (wages, job prospects and total employment) in these other occupations (as well as in the occupation in which they were trained) in making their decisions to immigrate.

For example, individuals trained as 'Financial Auditors and Accountants' can also work as 'Administrative Officers'. Since the job prospects for 'Administrative Officers' are good, and earnings and employment in the occupation are almost as high as for 'Financial Auditors and Accountants', new immigrants trained as 'Financial Auditors and Accountants' are likely to have good employment opportunities as 'Administrative Officers'.

Some new immigrants trained in the occupations in this category would be able to enter those occupations on immigrating to Canada, and they would be able to use their skills and knowledge in another occupation in the Model: it would seem reasonable therefore that they be given a high priority in the immigration selection process.

To some extent, governments would also be able to use immigration as a short-run mechanism for reducing labour shortages in the occupations in this category. But since new immigrants in the occupations in this category are likely to have employment opportunities in other occupations, such a policy may not be effective. For example, increasing the number of immigrants, qualified in a foreign country to work as 'Electrical and Electronics Engineering Technologists and Technicians', could be used to try to increase the short-run supply in the occupation; but the policy may not be successful since new immigrants may choose to enter another occupation instead (such as 'Industrial Instrument Technicians and Mechanics').

As in the category above, it would also be useful for governments to undertake policies and programs that would help to eliminate or reduce informal barriers that may make it difficult for new immigrants to obtain employment in some of these occupations. These policies may include, for example, encouraging employers to provide jobs for qualified new immigrants, and instituting programs to ensure that new immigrants are well informed about the availability of labour market information and the methods they can use for accessing it.

6.3 Suggestions for future work

As pointed out in the text in this Report, there are some limitations in the Model described here. We therefore make a number of suggestions for improving it.

6.3.1 Increasing the number of occupations in the Model

The Model includes 200 occupations in Skill Level A and Skill Level B in the NOC. This means that occupations in Management and in Skill Level C and Skill Level D were excluded. In addition, a number of occupations in Skill Level A and Skill Level B (such as Supervisors) were excluded because they were considered to be too heterogeneous for us to meaningfully identify skills transferability coefficients for them. It seems important that some attempt should be made to develop a method for incorporating these occupations (particularly Management occupations) into the Model.

6.3.2 Modifying the values of the parameters in the Model

The Model described in this Report is based on particular values of the parameters: for example, the earnings and employment in different occupations are based on 1996 Census data. These values can easily be replaced by estimates from the 2001 Census to update the Derived Index for each occupation.

It is also fairly straightforward to use different measures for the various parameters in the Model. For example, we used the levels of earnings and employment in the Model; but it would be useful to use the relative change in these factors to determine if this makes a significant difference to the Index (modification along these lines was suggested by one of the referees of the Report).

Another modification (also suggested by one of the referees of this Report) would be to introduce some variation in the coefficients of skills transferability (set at 0 and 1 in the Model) and in the index for occupational barriers (set at 0, 0.5 and 1 in the Model). Some additional research would be required to explore different possibilities and to study their potential impact on the Derived Index.

6.3.3 Applying the Model for different provinces and territories

The Model described in this Report is national and takes no account of jurisdictional differences. Jurisdictional differences in occupational barriers usually imply there is an effective barrier in some jurisdictions but not in others. In the Model we treat such barriers as being partially effective. This seemed to be a reasonable approach given the exploratory nature of the Model. It would make sense to develop a model for each jurisdiction, but this would that 13 different models would have to be developed. The Model can also be modified to study the effects of barriers in different provinces and territories on the occupational opportunities of workers in the labour force.

It would be fairly straightforward to make the required modification since formal or institutional barriers are available by jurisdiction in one of the background reports prepared for this study. However, some additional empirical work to identify informal

occupational barriers would also be useful. Data on the economic factors in the Model (earnings, job prospects, and employment level) would also need to be developed for different jurisdictions.

6.3.4 Using the Model for exploring supply adjustments by occupation

Occupational barriers may affect new immigrants in two different ways:

- They may restrict or prevent new immigrants in a given occupation from working in the *same* occupation in Canada;
- They may restrict or prevent new immigrants in a given occupation from working in a *different* occupation in Canada.

The Model described in this Report *includes* the effects of barriers in restricting or preventing entry to the same occupation. However, it can be modified so that it can be used for identifying new employment opportunities for those already working in Canada. In this case, the Model should *exclude* the effects of barriers that affect entry to the same occupation (except in cases in which inter-jurisdictional barriers exist). With this modification, the Model could be used to provide information on occupational choice for workers in the Canadian workforce. For example, if the Model were modified in this way, it could be used to address questions such as the following:

- What are the potential employment opportunities for a worker in a given occupation in the Canadian workforce?
- Which occupations provide the most potential employment opportunities for workers in Canada?
- Which occupations provide the least potential employment opportunities for workers in Canada?

6.3.5 Using the Model for examining employment opportunities for new graduates

The Model described here can also be adapted to provide information on occupational choices of new graduates in Canada. This would require the development of an additional model for identifying the occupational choices of new graduates in different fields of study (and hence with particular skills and knowledge). Such a modification would be useful as a basis for providing career guidance for new graduates; or it would be useful as an analytical tool for studying changes in the supply of new graduates on the potential supply of labour by occupation

Appendix I: Mathematical Specification of the Model

The Model can be expressed in mathematical form as follows:

$$DI_j = a_{j1}wb_1p_1g_1e_1 + a_{j2}wb_2p_2g_2e_2 + \ldots\ldots + a_{jn}wb_np_ng_ne_n \quad (1)$$

The subscript j indicates any one of the n occupations included in the Model.

DI_j = the Derived Index for occupation j.

a_{jk} = coefficients of skills transferability (where k indicates any occupation and $a_{jk} = 1$ if transfer from occupation j to occupation k is possible, and 0 otherwise).

w = a weight to ensure that the maximum value of DI is 1.

b_j = index of occupational barriers ($0 \leq b_j \leq 1$) where 0 indicates that the barrier is completely effective, 0.5 indicates that it is partially effective, and 1 indicates that it is ineffective.

p_j = index of the level of earnings in occupation j ($0 < p_j \leq 1$).

g_j = index of projected job growth in occupation j ($0 \leq g_j \leq 1$).

e_j = index of the level employment in occupation j ($0 < e_j \leq 1$).

Since the factors of the Model are all constrained to lie between 0 and 1, the minimum value of the Derived Index will be 0, and the maximum value will be 1. The maximum value occurs when the coefficients of skills transferability and the factors (i.e. a_{jk}, b_j, p_j, g_j, and e_j) are all equal to 1: in this case the sum of the products of the skills coefficients and the factors equals the number of occupations in the Model. It follows that the weight w required for ensuring that the maximum value of DI is the inverse of the number of occupations in the Model. Note that the maximum value of the Derived Index is not likely to occur in practice for any occupation since it implies that transfer to *all* other occupations is potentially possible for that occupation.

The model can also be expressed in matrix form as:

DI = ABPGEW

DI is a column vector of the Derived Index for each occupation.

A is a square matrix of coefficients of skills transferability between occupations.

B is a diagonal matrix in which the j^{th} element is b_j.

P is a diagonal matrix in which the j^{th} element is p_j.

G is a diagonal matrix in which the j^{th} element is g_j.

E is a diagonal matrix in which the j^{th} element is e_j.

W is a column unit vector (i.e. in which the j^{th} element is 1/the total number of occupations in the Model.

Appendix II: Derived Index for each Occupation

NOC Occupation (4-digit)	Derived Index	Rank of Derived Index	Rank of group
1111 Financial auditors and accountants	0.000528	2	1
1112 Financial and investment analysts	0.000096	30	2
1113 Securities agents, investment dealers and traders	0.000048	63	4
1121 Specialists in human resources	0.000099	28	2
1122 Professional occupations in business services to management	0.000059	49	3
1221 Administrative officers	0.000456	4	1
1222 Executive assistants	0.000456	5	1
1223 Personnel and recruitment officers	0.000035	73	4
1225 Purchasing agents and officers	0.000054	58	3
1226 Conference and event planners	0.000300	8	1
1228 Immigration, unemployment insurance and revenue officers	0.000000	175	10
1231 Bookkeepers	0.000098	29	2
1232 Loan officers	0.000060	48	3
1233 Insurance adjusters and claims examiners	0.000168	13	1
1234 Insurance underwriters	0.000156	15	1
1241 Secretaries (except legal and medical)	0.000170	12	1
1242 Legal secretaries	0.000192	11	1
1243 Medical secretaries	0.000192	10	1
2111 Physicists and astronomers	0.000030	79	4
2112 Chemists	0.000090	33	2
2113 Geologists, geochemists and geophysicists	0.000013	108	6
2114 Meteorologists	0.000002	162	9
2121 Biologists and related scientists	0.000074	36	2
2122 Forestry professionals	0.000009	115	6
2123 Agricultural representatives, consultants and specialists	0.000007	128	7
2131 Civil engineers	0.000114	20	1
2132 Mechanical engineers	0.000105	26	2
2133 Electrical and electronics engineers	0.000220	9	1
2134 Chemical engineers	0.000062	45	3
2141 Industrial and manufacturing engineers	0.000090	32	2
2142 Metallurgical and materials engineers	0.000054	59	3
2143 Mining engineers	0.000037	69	4
2144 Geological engineers	0.000035	72	4
2145 Petroleum engineers	0.000057	51	3
2146 Aerospace engineers	0.000041	66	4
2147 Computer engineers	0.000636	1	1
2151 Architects	0.000041	65	4
2152 Landscape architects	0.000027	86	5

NOC Occupation (4-digit)	Derived Index	Rank of Derived Index	Rank of group
2153 Urban and land use planners	0.000070	41	3
2154 Land surveyors	0.000010	113	6
2161 Mathematicians, statisticians and actuaries	0.000445	6	1
2162 Computer systems analysts	0.000494	3	1
2163 Computer programmers	0.000416	7	1
2211 Applied chemical technologists and technicians	0.000047	64	4
2212 Geological and mineral technologists and technicians	0.000008	120	6
2213 Meteorological technicians	0.000001	171	9
2221 Biological technologists and technicians	0.000032	76	4
2223 Forestry technologists and technicians	0.000004	143	8
2224 Conservation and fishery officers	0.000002	159	8
2230 Civil engineering technologists and technicians and construction estimators	0.000055	57	3
2232 Mechanical engineering technologists and technicians	0.000036	70	4
2233 Industrial engineering and manufacturing technologists and technicians	0.000033	75	4
2241 Electrical and electronics engineering technologists and technicians	0.000154	16	1
2242 Electronic service technicians (household and business equipment)	0.000063	44	3
2243 Industrial instrument technicians and mechanics	0.000014	101	6
2244 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors	0.000000	175	10
2251 Architectural technologists and technicians	0.000056	53	3
2252 Industrial designers	0.000030	78	4
2253 Drafting technologists and technicians	0.000026	88	5
2254 Survey technologists and technicians	0.000001	167	9
2264 Construction inspectors	0.000008	117	6
2271 Air pilots, flight engineers and flying instructors	0.000024	89	5
2272 Air traffic control occupations	0.000000	175	10
2273 Deck officers, water transport	0.000000	175	10
2274 Engineer officers, water transport	0.000000	175	10
3111 Specialist physicians	0.000055	54	3
3112 General practitioners and family physicians	0.000055	55	3
3113 Dentists	0.000000	175	10
3114 Veterinarians	0.000059	50	3
3121 Optometrists	0.000003	153	8
3122 Chiropractors	0.000000	175	10
3131 Pharmacists	0.000073	37	2
3132 Dietitians and nutritionists	0.000073	38	2
3141 Audiologists and speech-language pathologists	0.000004	140	7
3142 Physiotherapists	0.000055	56	3
3143 Occupational therapists	0.000000	175	10
3151 Head nurses and supervisors	0.000000	175	10
3152 Registered nurses	0.000068	42	3
3211 Medical laboratory technologists and pathologists' assistants	0.000052	60	3

NOC Occupation (4-digit)	Derived Index	Rank of Derived Index	Rank of group
3212 Medical laboratory technicians	0.000029	81	5
3213 Animal health technologists	0.000003	151	8
3214 Respiratory therapists and clinical perfusionists	0.000008	118	6
3215 Medical radiation technologists	0.000000	175	10
3216 Medical sonographers	0.000000	175	10
3217 Cardiology Technologies	0.000001	165	9
3218 Electroencephalographic and other diagnostic technologists n.e.c.	0.000000	175	10
3221 Denturists	0.000000	175	10
3222 Dental hygienists and dental therapists	0.000000	175	10
3231 Opticians	0.000003	154	8
3233 Registered nursing assistants	0.000000	175	10
3234 Ambulance attendants and other paramedical occupations	0.000011	110	6
4112 Lawyers and Quebec notaries	0.000000	175	10
4141 Secondary school teachers	0.000013	103	6
4142 Elementary school and kindergarten teachers	0.000013	104	6
4143 School and guidance counsellors	0.000087	34	2
4151 Psychologists	0.000100	27	2
4152 Social workers	0.000131	19	1
4153 Family, marriage and other related counsellors	0.000096	31	2
4155 Probation and parole officers and related occupations	0.000062	46	3
4162 Economists and economic policy researchers and analysts	0.000154	17	1
4163 Economic development officers and marketing researchers and consultants	0.000052	62	4
4166 Education policy researchers, consultants and program officers	0.000026	87	5
4167 Recreation and sports program supervisors and consultants	0.000041	68	4
4168 Program officers unique to government	0.000000	175	10
4212 Community and social service workers	0.000057	52	3
4213 Employment counsellors	0.000052	61	4
4215 Instructors and teachers of disabled persons	0.000013	105	6
5111 Librarians	0.000032	77	4
5112 Conservators and curators	0.000003	155	8
5113 Archivists	0.000035	74	4
5121 Writers	0.000111	21	2
5122 Editors	0.000111	22	2
5123 Journalists	0.000111	23	2
5124 Professional occupations in public relations and communications	0.000111	24	2
5125 Translators, terminologists and interpreters	0.000015	96	5
5131 Producers, directors, choreographers and related occupations	0.000028	84	5
5132 Conductors, composers and arrangers	0.000020	90	5
5133 Musicians and singers	0.000018	92	5
5134 Dancers	0.000003	150	8
5135 Actors	0.000016	95	5
5136 Painters, sculptors and other visual artists	0.000008	119	6

NOC Occupation (4-digit)	Derived Index	Rank of Derived Index	Rank of group
5211 Library and archive technicians and assistants	0.000014	102	6
5221 Photographers	0.000011	111	6
5222 Film and video camera operators	0.000005	135	7
5223 Graphic arts technicians	0.000007	123	7
5224 Broadcast technicians	0.000015	97	5
5225 Audio and video recording technicians	0.000015	98	5
5226 Other technical occupations in motion pictures, broadcasting and the performing arts	0.000017	93	5
5227 Support and assisting occupations in motion pictures, broadcasting and the performing arts	0.000017	94	5
5231 Announcers and other broadcasters	0.000010	112	6
5241 Graphic designers and illustrating artists	0.000070	40	2
5242 Interior designers	0.000005	136	7
5245 Patternmakers - Textile, leather and fur products	0.000002	164	9
5254 Program leaders and instructors in recreation and sport	0.000029	82	5
6231 Insurance agents and brokers	0.000168	14	1
6232 Real estate agents and salespersons	0.000144	18	1
6233 Retail and wholesale buyers	0.000107	25	2
6241 Chefs	0.000036	71	4
6242 Cooks	0.000030	80	4
6251 Butchers and meat cutters, retail and wholesale	0.000013	107	6
6252 Bakers	0.000007	122	7
6261 Police officers (except commissioned)	0.000000	175	10
6262 Fire-fighters	0.000000	175	10
6271 Hairstylists and barbers	0.000028	83	5
6272 Funeral directors and embalmers	0.000003	152	8
7231 Machinists and machining and tooling inspectors	0.000061	47	3
7232 Tool and die makers	0.000007	121	7
7241 Electricians (except industrial and power system)	0.000000	175	10
7242 Industrial electricians	0.000015	99	5
7243 Power system electricians	0.000003	157	8
7244 Electrical power line and cable workers	0.000006	131	7
7245 Telecommunications line and cable workers	0.000004	146	8
7246 Telecommunications installation and repair workers	0.000012	109	6
7247 Cable television service and maintenance technicians	0.000007	130	7
7251 Plumbers	0.000000	175	10
7252 Steamfitters, pipefitters and sprinkler system installers	0.000007	125	7
7253 Gas fitters	0.000002	163	9
7261 Sheet metal workers	0.000000	175	10
7262 Boilermakers	0.000004	138	7
7263 Structural metal and platework fabricators and fitters	0.000004	139	7
7264 Ironworkers	0.000003	156	8
7266 Blacksmiths & Die setters	0.000001	170	9
7271 Carpenters	0.000067	43	3
7272 Cabinetmakers	0.000004	141	8

NOC Occupation (4-digit)	Derived Index	Rank of Derived Index	Rank of group
7281 Bricklayers	0.000004	144	8
7282 Cement finishers	0.000002	161	9
7283 Tilesetters	0.000001	169	9
7284 Plasterers, drywall installers and finishers, and lathers	0.000010	114	6
7291 Roofers and shinglers	0.000007	129	7
7292 Glaziers	0.000004	142	8
7293 Insulators	0.000004	145	8
7294 Painters and decorators	0.000015	100	5
7295 Floor covering installers	0.000006	132	7
7311 Construction millwrights and industrial mechanics (except textile)	0.000073	39	2
7312 Heavy-duty equipment mechanics	0.000041	67	4
7313 Refrigeration and air conditioning mechanics	0.000000	175	10
7315 Aircraft mechanics and aircraft inspectors	0.000007	126	7
7316 Machine fitters	0.000007	127	7
7317 Textile machinery mechanics & repairers	0.000001	166	9
7318 Elevator constructors and mechanics	0.000004	147	8
7321 Motor vehicle mechanics, technicians and mechanical repairers	0.000084	35	2
7322 Motor vehicle body repairers	0.000020	91	5
7331 Oil and solid fuel heating mechanics	0.000002	158	8
7332 Electric appliance servicers and repairers	0.000005	137	7
7333 Electrical mechanics	0.000006	133	7
7334 Motorcycle and other related mechanics	0.000001	173	9
7335 Other small engine and equipment mechanics	0.000003	149	8
7341 Upholsterers	0.000003	148	8
7342 Tailors, dressmakers, furriers and milliners	0.000007	124	7
7343 Shoe repairers and Shoemakers	0.000001	168	9
7351 Stationary engineers and auxiliary equipment operators	0.000028	85	5
7352 Power systems and power station operators	0.000013	106	6
7371 Crane operators	0.000000	175	10
7372 Drillers & Blasters	0.000002	160	8
7373 Water Well Drillers	0.000001	172	9
7381 Printing Press Operators	0.000009	116	6
7382 Commercial divers	0.000001	174	9
8241 Logging machinery operators	0.000005	134	7
8261 Fishing masters and officers	0.000000	175	10
8262 Fishing vessel skippers and fishermen/women	0.000000	175	10

Appendix III: Derived Index standardized for differences by occupation in the values of each factor

NOC Occupation (4-digit)	Base Model	No skills transfer-ability	No barriers	Same wage in each occupation	Good job prospects in each occupation	Same employment in each occupation
1111 Financial auditors and accountants	0.000528	0.000120	0.000648	0.002046	0.000637	0.004108
1112 Financial and investment analysts	0.000096	0.000037	0.000192	0.000242	0.000096	0.002038
1113 Securities agents, investment dealers and traders	0.000048	0.000048	0.000096	0.000088	0.000048	0.001355
1121 Specialists in human resources	0.000099	0.000064	0.000099	0.000283	0.000131	0.002775
1122 Professional occupations in business services to management	0.000059	0.000059	0.000118	0.000157	0.000059	0.000936
1221 Administrative officers	0.000456	0.000256	0.000456	0.001975	0.000795	0.003112
1222 Executive assistants	0.000456	0.000030	0.000456	0.001975	0.000795	0.003112
1223 Personnel and recruitment officers	0.000035	0.000035	0.000035	0.000120	0.000035	0.001470
1225 Purchasing agents and officers	0.000054	0.000054	0.000054	0.000169	0.000054	0.001608
1226 Conference and event planners	0.000300	0.000014	0.000300	0.001091	0.000300	0.003850
1228 Immigration, unemployment insurance and revenue officers	0.000000	0.000000	0.000056	0.000000	0.000000	0.000000
1231 Bookkeepers	0.000098	0.000098	0.000098	0.000610	0.000147	0.000536
1232 Loan officers	0.000060	0.000060	0.000060	0.000221	0.000060	0.001349
1233 Insurance adjusters and claims examiners	0.000168	0.000026	0.000194	0.000577	0.000168	0.002202
1234 Insurance underwriters	0.000156	0.000014	0.000170	0.000540	0.000156	0.002149
1241 Secretaries (except legal and medical)	0.000170	0.000170	0.000170	0.000952	0.000509	0.000297
1242 Legal secretaries	0.000192	0.000022	0.000192	0.001061	0.000576	0.000639
1243 Medical secretaries	0.000192	0.000022	0.000192	0.001082	0.000576	0.000584
2111 Physicists and astronomers	0.000030	0.000004	0.000056	0.000084	0.000051	0.001822
2112 Chemists	0.000090	0.000012	0.000138	0.000336	0.000142	0.002997
2113 Geologists, geochemists and geophysicists	0.000013	0.000005	0.000025	0.000037	0.000027	0.000873
2114 Meteorologists	0.000002	0.000001	0.000003	0.000006	0.000005	0.001199
2121 Biologists and related scientists	0.000074	0.000019	0.000101	0.000287	0.000105	0.002645
2122 Forestry professionals	0.000009	0.000005	0.000018	0.000030	0.000020	0.000842
2123 Agricultural representatives, consultants and specialists	0.000007	0.000003	0.000013	0.000026	0.000015	0.000710
2131 Civil engineers	0.000114	0.000055	0.000227	0.000352	0.000142	0.003005
2132 Mechanical engineers	0.000105	0.000046	0.000210	0.000308	0.000135	0.003883
2133 Electrical and electronics engineers	0.000220	0.000062	0.000440	0.000716	0.000242	0.003513
2134 Chemical engineers	0.000062	0.000016	0.000124	0.000207	0.000085	0.002663
2141 Industrial and manufacturing engineers	0.000090	0.000011	0.000180	0.000266	0.000112	0.002602
2142 Metallurgical and materials engineers	0.000054	0.000002	0.000107	0.000194	0.000080	0.002103

NOC Occupation (4-digit)	Base Model	No skills transfer-ability	No barriers	Same wage in each occupation	Good job prospects in each occupation	Same employment in each occupation
2143 Mining engineers	0.000037	0.000004	0.000074	0.000131	0.000056	0.001681
2144 Geological engineers	0.000035	0.000002	0.000071	0.000128	0.000053	0.001618
2145 Petroleum engineers	0.000057	0.000006	0.000115	0.000200	0.000086	0.002302
2146 Aerospace engineers	0.000041	0.000005	0.000082	0.000139	0.000061	0.001725
2147 Computer engineers	0.000636	0.000018	0.000856	0.001931	0.000719	0.006332
2151 Architects	0.000041	0.000014	0.000082	0.000145	0.000057	0.001485
2152 Landscape architects	0.000027	0.000002	0.000055	0.000104	0.000040	0.001038
2153 Urban and land use planners	0.000070	0.000011	0.000139	0.000185	0.000070	0.001898
2154 Land surveyors	0.000010	0.000010	0.000020	0.000036	0.000010	0.000694
2161 Mathematicians, statisticians and actuaries	0.000445	0.000011	0.000474	0.001290	0.000516	0.004492
2162 Computer systems analysts	0.000494	0.000294	0.000571	0.001421	0.000564	0.004383
2163 Computer programmers	0.000416	0.000122	0.000416	0.001216	0.000478	0.002819
2211 Applied chemical technologists and technicians	0.000047	0.000018	0.000064	0.000193	0.000070	0.001207
2212 Geological and mineral technologists and technicians	0.000008	0.000008	0.000015	0.000026	0.000012	0.000497
2213 Meteorological technicians	0.000001	0.000001	0.000002	0.000003	0.000001	0.000521
2221 Biological technologists and technicians	0.000032	0.000003	0.000036	0.000143	0.000053	0.000937
2223 Forestry technologists and technicians	0.000004	0.000004	0.000008	0.000016	0.000012	0.000206
2224 Conservation and fishery officers	0.000002	0.000002	0.000005	0.000011	0.000007	0.000191
2230 Civil engineering technologists and technicians and construction estimators	0.000055	0.000020	0.000110	0.000194	0.000085	0.001638
2232 Mechanical engineering technologists and technicians	0.000036	0.000010	0.000071	0.000127	0.000053	0.000990
2233 Industrial engineering and manufacturing technologists and technicians	0.000033	0.000007	0.000066	0.000120	0.000050	0.000971
2241 Electrical and electronics engineering technologists and technicians	0.000154	0.000050	0.000330	0.000559	0.000167	0.002771
2242 Electronic service technicians (household and business equipment)	0.000063	0.000063	0.000127	0.000261	0.000063	0.000606
2243 Industrial instrument technicians and mechanics	0.000014	0.000014	0.000029	0.000038	0.000014	0.000947
2244 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors	0.000000	0.000000	0.000022	0.000000	0.000000	0.000000
2251 Architectural technologists and technicians	0.000056	0.000002	0.000111	0.000194	0.000086	0.001675
2252 Industrial designers	0.000030	0.000005	0.000056	0.000112	0.000052	0.000964
2253 Drafting technologists and technicians	0.000026	0.000026	0.000052	0.000097	0.000039	0.000443
2254 Survey technologists and technicians	0.000001	0.000001	0.000003	0.000006	0.000004	0.000175
2264 Construction inspectors	0.000008	0.000008	0.000017	0.000028	0.000013	0.000497
2271 Air pilots, flight engineers and flying instructors	0.000024	0.000024	0.000048	0.000049	0.000024	0.001225
2272 Air traffic control occupations	0.000000	0.000000	0.000017	0.000000	0.000000	0.000000
2273 Deck officers, water transport	0.000000	0.000000	0.000018	0.000000	0.000000	0.000000

NOC Occupation (4-digit)	Base Model	No skills transfer-ability	No barriers	Same wage in each occupation	Good job prospects in each occupation	Same employment in each occupation
2274 Engineer officers, water transport	0.000000	0.000000	0.000007	0.000000	0.000000	0.000000
3111 Specialist physicians	0.000055	0.000000	0.000532	0.000225	0.000076	0.001641
3112 General practitioners and family physicians	0.000055	0.000000	0.000351	0.000225	0.000076	0.001641
3113 Dentists	0.000000	0.000000	0.000139	0.000000	0.000000	0.000000
3114 Veterinarians	0.000059	0.000000	0.000110	0.000245	0.000080	0.002039
3121 Optometrists	0.000003	0.000000	0.000020	0.000014	0.000005	0.000359
3122 Chiropractors	0.000000	0.000000	0.000015	0.000000	0.000000	0.000000
3131 Pharmacists	0.000073	0.000000	0.000184	0.000290	0.000103	0.002089
3132 Dietitians and nutritionists	0.000073	0.000000	0.000131	0.000290	0.000103	0.002089
3141 Audiologists and speech-language pathologists	0.000004	0.000004	0.000009	0.000014	0.000006	0.000521
3142 Physiotherapists	0.000055	0.000000	0.000116	0.000225	0.000076	0.001641
3143 Occupational therapists	0.000000	0.000000	0.000011	0.000000	0.000000	0.000000
3151 Head nurses and supervisors	0.000000	0.000000	0.000600	0.000000	0.000000	0.000000
3152 Registered nurses	0.000068	0.000000	0.000637	0.000348	0.000103	0.001069
3211 Medical laboratory technologists and pathologists' assistants	0.000052	0.000023	0.000075	0.000210	0.000067	0.001464
3212 Medical laboratory technicians	0.000029	0.000029	0.000029	0.000128	0.000044	0.000760
3213 Animal health technologists	0.000003	0.000003	0.000006	0.000020	0.000003	0.000398
3214 Respiratory therapists and clinical perfusionists	0.000008	0.000008	0.000016	0.000023	0.000008	0.000840
3215 Medical radiation technologists	0.000000	0.000000	0.000035	0.000000	0.000000	0.000000
3216 Medical sonographers	0.000000	0.000000	0.000006	0.000000	0.000000	0.000000
3217 Cardiology Technologies	0.000001	0.000001	0.000003	0.000006	0.000001	0.000574
3218 Electroencephalographic and other diagnostic technologists n.e.c.	0.000000	0.000000	0.000003	0.000000	0.000000	0.000000
3221 Denturists	0.000000	0.000000	0.000004	0.000000	0.000000	0.000000
3222 Dental hygienists and dental therapists	0.000000	0.000000	0.000027	0.000000	0.000000	0.000000
3231 Opticians	0.000003	0.000003	0.000006	0.000014	0.000005	0.000359
3233 Registered nursing assistants	0.000000	0.000000	0.000003	0.000000	0.000000	0.000000
3234 Ambulance attendants and other paramedical occupations	0.000011	0.000011	0.000022	0.000041	0.000017	0.000446
4112 Lawyers and Quebec notaries	0.000000	0.000000	0.000314	0.000000	0.000000	0.000000
4141 Secondary school teachers	0.000013	0.000000	0.000769	0.000057	0.000020	0.000382
4142 Elementary school and kindergarten teachers	0.000013	0.000000	0.000769	0.000057	0.000020	0.000382
4143 School and guidance counsellors	0.000087	0.000000	0.000879	0.000434	0.000131	0.001802
4151 Psychologists	0.000100	0.000000	0.000146	0.000501	0.000150	0.001871
4152 Social workers	0.000131	0.000031	0.000167	0.000615	0.000197	0.002326
4153 Family, marriage and other related counsellors	0.000096	0.000039	0.000096	0.000487	0.000144	0.001334
4155 Probation and parole officers and related occupations	0.000062	0.000004	0.000066	0.000320	0.000092	0.001160
4162 Economists and economic policy researchers and analysts	0.000154	0.000017	0.000239	0.000371	0.000188	0.004968
4163 Economic development officers and marketing researchers and consultants	0.000052	0.000052	0.000052	0.000158	0.000078	0.001096

NOC Occupation (4-digit)	Base Model	No skills transfer-ability	No barriers	Same wage in each occupation	Good job prospects in each occupation	Same employment in each occupation
4166 Education policy researchers, consultants and program officers	0.000026	0.000026	0.000026	0.000081	0.000040	0.001087
4167 Recreation and sports program supervisors and consultants	0.000041	0.000012	0.000041	0.000494	0.000061	0.000787
4168 Program officers unique to government	0.000000	0.000000	0.000007	0.000000	0.000000	0.000000
4212 Community and social service workers	0.000057	0.000057	0.000057	0.000306	0.000086	0.000623
4213 Employment counsellors	0.000052	0.000017	0.000052	0.000190	0.000060	0.002267
4215 Instructors and teachers of disabled persons	0.000013	0.000013	0.000026	0.000057	0.000020	0.000382
5111 Librarians	0.000032	0.000018	0.000032	0.000158	0.000048	0.001387
5112 Conservators and curators	0.000003	0.000003	0.000003	0.000011	0.000005	0.000894
5113 Archivists	0.000035	0.000002	0.000035	0.000169	0.000052	0.002182
5121 Writers	0.000111	0.000036	0.000111	0.000434	0.000149	0.003851
5122 Editors	0.000111	0.000012	0.000111	0.000434	0.000149	0.003851
5123 Journalists	0.000111	0.000020	0.000111	0.000434	0.000149	0.003851
5124 Professional occupations in public relations and communications	0.000111	0.000043	0.000111	0.000434	0.000149	0.003851
5125 Translators, terminologists and interpreters	0.000015	0.000015	0.000015	0.000068	0.000023	0.000753
5131 Producers, directors, choreographers and related occupations	0.000028	0.000028	0.000028	0.000093	0.000042	0.001013
5132 Conductors, composers and arrangers	0.000020	0.000003	0.000020	0.000180	0.000031	0.001126
5133 Musicians and singers	0.000018	0.000018	0.000018	0.000169	0.000027	0.000349
5134 Dancers	0.000003	0.000003	0.000003	0.000033	0.000005	0.000331
5135 Actors	0.000016	0.000006	0.000016	0.000093	0.000025	0.001167
5136 Painters, sculptors and other visual artists	0.000008	0.000008	0.000008	0.000074	0.000012	0.000350
5211 Library and archive technicians and assistants	0.000014	0.000014	0.000014	0.000086	0.000021	0.000550
5221 Photographers	0.000011	0.000011	0.000011	0.000067	0.000016	0.000550
5222 Film and video camera operators	0.000005	0.000005	0.000005	0.000019	0.000008	0.000880
5223 Graphic arts technicians	0.000007	0.000007	0.000007	0.000039	0.000011	0.000619
5224 Broadcast technicians	0.000015	0.000006	0.000015	0.000063	0.000023	0.001713
5225 Audio and video recording technicians	0.000015	0.000009	0.000015	0.000063	0.000023	0.001713
5226 Other technical occupations in motion pictures, broadcasting and the performing arts	0.000017	0.000011	0.000017	0.000077	0.000025	0.001452
5227 Support and assisting occupations in motion pictures, broadcasting and the performing arts	0.000017	0.000006	0.000017	0.000077	0.000025	0.001452
5231 Announcers and other broadcasters	0.000010	0.000010	0.000010	0.000049	0.000015	0.000690
5241 Graphic designers and illustrating artists	0.000070	0.000063	0.000070	0.000342	0.000074	0.001655
5242 Interior designers	0.000005	0.000005	0.000010	0.000024	0.000007	0.000334
5245 Patternmakers - Textile, leather and fur products	0.000002	0.000002	0.000002	0.000010	0.000003	0.000605

NOC Occupation (4-digit)	Base Model	No skills transfer-ability	No barriers	Same wage in each occupation	Good job prospects in each occupation	Same employment in each occupation
5254 Program leaders and instructors in recreation and sport	0.000029	0.000029	0.000029	0.000423	0.000043	0.000226
6231 Insurance agents and brokers	0.000168	0.000142	0.000194	0.000577	0.000168	0.002202
6232 Real estate agents and salespersons	0.000144	0.000144	0.000144	0.000490	0.000144	0.001473
6233 Retail and wholesale buyers	0.000107	0.000052	0.000107	0.000368	0.000107	0.002923
6241 Chefs	0.000036	0.000006	0.000071	0.000323	0.000107	0.000236
6242 Cooks	0.000030	0.000030	0.000059	0.000291	0.000089	0.000085
6251 Butchers and meat cutters, retail and wholesale	0.000013	0.000013	0.000013	0.000077	0.000039	0.000280
6252 Bakers	0.000007	0.000007	0.000015	0.000058	0.000022	0.000107
6261 Police officers (except commissioned)	0.000000	0.000000	0.000210	0.000000	0.000000	0.000000
6262 Fire-fighters	0.000000	0.000000	0.000079	0.000000	0.000000	0.000000
6271 Hairstylists and barbers	0.000028	0.000028	0.000056	0.000240	0.000042	0.000196
6272 Funeral directors and embalmers	0.000003	0.000003	0.000006	0.000011	0.000005	0.000469
7231 Machinists and machining and tooling inspectors	0.000061	0.000055	0.000123	0.000223	0.000061	0.001389
7232 Tool and die makers	0.000007	0.000007	0.000015	0.000022	0.000022	0.000280
7241 Electricians (except industrial and power system)	0.000000	0.000000	0.000068	0.000000	0.000000	0.000000
7242 Industrial electricians	0.000015	0.000015	0.000030	0.000042	0.000046	0.000304
7243 Power system electricians	0.000003	0.000003	0.000005	0.000007	0.000008	0.000333
7244 Electrical power line and cable workers	0.000006	0.000006	0.000013	0.000017	0.000019	0.000313
7245 Telecommunications line and cable workers	0.000004	0.000004	0.000007	0.000011	0.000011	0.000274
7246 Telecommunications installation and repair workers	0.000012	0.000012	0.000025	0.000035	0.000037	0.000295
7247 Cable television service and maintenance technicians	0.000007	0.000007	0.000007	0.000023	0.000010	0.000956
7251 Plumbers	0.000000	0.000000	0.000038	0.000000	0.000000	0.000000
7252 Steamfitters, pipefitters and sprinkler system installers	0.000007	0.000000	0.000045	0.000024	0.000007	0.000701
7253 Gas fitters	0.000002	0.000002	0.000004	0.000007	0.000006	0.000242
7261 Sheet metal workers	0.000000	0.000000	0.000010	0.000000	0.000000	0.000000
7262 Boilermakers	0.000004	0.000001	0.000009	0.000016	0.000013	0.000463
7263 Structural metal and platework fabricators and fitters	0.000004	0.000003	0.000009	0.000016	0.000013	0.000463
7264 Ironworkers	0.000003	0.000003	0.000005	0.000011	0.000008	0.000213
7266 Blacksmiths & Die setters	0.000001	0.000001	0.000001	0.000004	0.000003	0.000427
7271 Carpenters	0.000067	0.000057	0.000133	0.000388	0.000100	0.000921
7272 Cabinetmakers	0.000004	0.000004	0.000008	0.000025	0.000012	0.000137
7281 Bricklayers	0.000004	0.000004	0.000007	0.000020	0.000011	0.000151
7282 Cement finishers	0.000002	0.000002	0.000005	0.000012	0.000007	0.000161
7283 Tilesetters	0.000001	0.000001	0.000002	0.000007	0.000004	0.000147
7284 Plasterers, drywall installers and finishers, and lathers	0.000010	0.000010	0.000019	0.000059	0.000014	0.000270
7291 Roofers and shinglers	0.000007	0.000007	0.000013	0.000045	0.000010	0.000250
7292 Glaziers	0.000004	0.000004	0.000008	0.000020	0.000006	0.000324

NOC Occupation (4-digit)	Base Model	No skills transfer-ability	No barriers	Same wage in each occupation	Good job prospects in each occupation	Same employment in each occupation
7293 Insulators	0.000004	0.000004	0.000007	0.000017	0.000005	0.000352
7294 Painters and decorators	0.000015	0.000015	0.000030	0.000113	0.000022	0.000218
7295 Floor covering installers	0.000006	0.000006	0.000013	0.000037	0.000009	0.000285
7311 Construction millwrights and industrial mechanics (except textile)	0.000073	0.000066	0.000145	0.000208	0.000105	0.001296
7312 Heavy-duty equipment mechanics	0.000041	0.000034	0.000082	0.000139	0.000058	0.001196
7313 Refrigeration and air conditioning mechanics	0.000000	0.000000	0.000031	0.000000	0.000000	0.000000
7315 Aircraft mechanics and aircraft inspectors	0.000007	0.000000	0.000040	0.000024	0.000007	0.000701
7316 Machine fitters	0.000007	0.000007	0.000014	0.000024	0.000007	0.000701
7317 Textile machinery mechanics & repairers	0.000001	0.000001	0.000003	0.000006	0.000002	0.000389
7318 Elevator constructors and mechanics	0.000004	0.000004	0.000007	0.000009	0.000005	0.000676
7321 Motor vehicle mechanics, technicians and mechanical repairers	0.000084	0.000084	0.000195	0.000371	0.000126	0.000378
7322 Motor vehicle body repairers	0.000020	0.000020	0.000040	0.000102	0.000030	0.000326
7331 Oil and solid fuel heating mechanics	0.000002	0.000002	0.000005	0.000012	0.000004	0.000338
7332 Electric appliance servicers and repairers	0.000005	0.000005	0.000009	0.000024	0.000007	0.000314
7333 Electrical mechanics	0.000006	0.000006	0.000012	0.000021	0.000009	0.000488
7334 Motorcycle and other related mechanics	0.000001	0.000001	0.000002	0.000005	0.000001	0.000265
7335 Other small engine and equipment mechanics	0.000003	0.000003	0.000007	0.000019	0.000005	0.000293
7341 Upholsterers	0.000003	0.000003	0.000003	0.000021	0.000010	0.000271
7342 Tailors, dressmakers, furriers and milliners	0.000007	0.000007	0.000007	0.000070	0.000022	0.000175
7343 Shoe repairers and Shoemakers	0.000001	0.000001	0.000001	0.000009	0.000004	0.000238
7351 Stationary engineers and auxiliary equipment operators	0.000028	0.000028	0.000055	0.000080	0.000028	0.000861
7352 Power systems and power station operators	0.000013	0.000013	0.000026	0.000028	0.000013	0.001165
7371 Crane operators	0.000000	0.000000	0.000011	0.000000	0.000000	0.000000
7372 Drillers & Blasters	0.000002	0.000002	0.000002	0.000008	0.000007	0.000469
7373 Water Well Drillers	0.000001	0.000001	0.000001	0.000004	0.000003	0.000352
7381 Printing Press Operators	0.000009	0.000009	0.000018	0.000034	0.000027	0.000220
7382 Commercial divers	0.000001	0.000001	0.000001	0.000003	0.000002	0.000373
8241 Logging machinery operators	0.000005	0.000005	0.000011	0.000021	0.000016	0.000214
8261 Fishing masters and officers	0.000000	0.000000	0.000018	0.000000	0.000000	0.000000
8262 Fishing vessel skippers and fishermen/women	0.000000	0.000000	0.000016	0.000000	0.000000	0.000000

Appendix IV: Matrix of Skills Transferability

NOC Occupations	Occupations to which potential for skills transferability exists
Professional – Business, Finance and Administration	
1111 Financial auditors and accountants	1111; 1221; 1225; 1231
1112 Financial and investment analysts	1112; 1122
1113 Securities agents, investment dealers and traders	1113
1114 Other financial officers	1114
1121 Specialists in human resources	1121; 1223
1122 Professional occupations in business services to management	1122
Skilled – Business, Finance and Administration	
1221 Administrative officers	1221; 1222; 1241
1222 Executive assistants	1221; 1222; 1241
1223 Personnel and recruitment officers	1223
1225 Purchasing agents and officers	1225
1226 Conference and event planners	1221; 1222; 1226
1228 Immigration, unemployment insurance and revenue officers	1228; 4168
1231 Bookkeepers	1231
1232 Loan officers	1232
1233 Insurance adjusters and claims examiners	1233; 6231
1234 Insurance underwriters	1234; 6231
1241 Secretaries (except legal and medical)	1241
1242 Legal secretaries	1241; 1242
1243 Medical secretaries	1241; 1243
Professional – Natural and Applied Sciences	
2111 Physicists and astronomers	2111; 2147; 2212
2112 Chemists	2112; 2211; 2212; 3211; 3212
2113 Geologists, geochemists and geophysicists	2113; 2212
2114 Meteorologists	2114; 2213
2121 Biologists and related scientists	2121; 2221; 3211; 3212
2122 Forestry professionals	2122; 2223
2123 Agricultural representatives, consultants and specialists	2123; 2221
2131 Civil engineers	2131; 2154; 2230; 2251; 2253; 2254
2132 Mechanical engineers	2132; 2141; 2146; 2232; 2233; 2253
2133 Electrical and electronics engineers	2133; 2147; 2241; 2242; 2253
2134 Chemical engineers	2134; 2211; 2142; 2253
2141 Industrial and manufacturing engineers	2132; 2141; 2233; 2253
2142 Metallurgical and materials engineers	2142; 2211; 2212; 2253
2143 Mining engineers	2143; 2212; 2253
2144 Geological engineers	2144; 2212; 2253
2145 Petroleum engineers	2145; 2211; 2212; 2253
2146 Aerospace engineers	2146; 2232; 2253
2147 Computer engineers	2133; 2147; 2162; 2163; 2241; 2242; 2253
2151 Architects	2151; 2251; 2253
2152 Landscape architects	2152; 2253

NOC Occupations	Occupations to which potential for skills transferability exists
2153 Urban and land use planners	1122; 2153
2154 Land surveyors	2154
2161 Mathematicians, statisticians and actuaries	2147; 2161; 2162; 2163
2162 Computer systems analysts	1122; 2162; 2147; 2163
2163 Computer programmers	2162; 2163
Technical – Science and Applied Sciences	
2211 Applied chemical technologists and technicians	2211; 3212
2212 Geological and mineral technologists and technicians	2212
2213 Meteorological technicians	2213
2221 Biological technologists and technicians	2221; 3212
2223 Forestry technologists and technicians	2223
2224 Conservation and fishery officers	2224
2230 Civil engineering technologists and technicians and construction estimators	2230; 2253; 2254; 2264
2232 Mechanical engineering technologists and technicians	2232; 2253
2233 Industrial engineering and manufacturing technologists and technicians	2233; 2253
2241 Electrical and electronics engineering technologists and technicians	2241; 2242; 2243; 2244; 2253
2242 Electronic service technicians (household and business equipment)	2242
2243 Industrial instrument technicians and mechanics	2243
2244 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors	2242
2251 Architectural technologists and technicians	2251; 2253; 2230; 2264
2252 Industrial designers	2252; 2253
2253 Drafting technologists and technicians	2253
2254 Survey technologists and technicians	2254
2264 Construction inspectors	2264
2271 Air pilots, flight engineers and flying instructors	2271
2272 Air traffic control occupations	2272
2273 Deck officers, water transport	2273
2274 Engineer officers, water transport	2274
Professional – Health Occupations	
3111 Specialist physicians	2221; 3111; 3112; 3211; 3212
3112 General practitioners and family physicians	2221; 3112; 3211; 3212
3113 Dentists	3113; 3221; 3222
3114 Veterinarians	2221; 3114; 3211; 3212; 3213
3121 Optometrists	3121; 3231
3122 Chiropractors	3122; 4160
3131 Pharmacists	2211; 2221; 3131; 3211; 3212
3132 Dietitians and nutritionists	2211; 2221; 3132; 3211; 3212
3141 Audiologists and speech-language pathologists	3141
3142 Physiotherapists	2221; 3142; 3211; 3212
3143 Occupational therapists	3143
3151 Head nurses and supervisors	3151; 3152; 3233
3152 Registered nurses	3152; 3233; 3234; 4212
Technical – Health Occupations	
3211 Medical laboratory technologists and pathologists' assistants	3211; 3212
3212 Medical laboratory technicians	3212
3213 Animal health technologists	3213
3214 Respiratory therapists and clinical perfusionists	3214

NOC Occupations	Occupations to which potential for skills transferability exists
3215 Medical radiation technologists	3215
3216 Medical sonographers	3216
3217 Cardiology Technologies	3217
3218 Electroencephalographic and other diagnostic technologists n.e.c.	3218
3221 Denturists	3221
3222 Dental hygienists and dental therapists	3222
3231 Opticians	3231
3233 Registered nursing assistants	3233
3234 Ambulance attendants and other paramedical occupations	3234
Professional – Social Science, Education, Government etc.	
4112 Lawyers and Quebec notaries	4112; 4211
4121 University professors	4121; 4122; 4131
4122 Post-secondary teaching and research assistants	4122
4131 College and other vocational instructors	4131
4141 Secondary school teachers	4141; 4142; 4215
4142 Elementary school and kindergarten teachers	4141; 4142; 4215
4143 School and guidance counsellors	4141; 4142; 4143; 4212; 4213; 4215
*4151 Psychologists	4151; 4153; 4155; 4212
*4152 Social workers	4152; 4153; 4155; 4212
*4153 Family, marriage and other related counsellors	4153; 4212
4154 Ministers of religion	4154; 4217
4155 Probation and parole officers and related occupations	4155; 4212
4162 Economists and economic policy researchers and analysts	1112; 1113; 4162; 4163
4163 Economic development officers and marketing researchers and consultants	4163
4166 Education policy researchers, consultants and program officers	4166
4167 Recreation and sports program supervisors and consultants	4167; 5254
4168 Program officers unique to government	4168
Technical – Social Science, Education Government etc.	
4212 Community and social service workers	4212
4213 Employment counsellors	1223; 4213
4215 Instructors and teachers of disabled persons	4215
Professional – Art, Culture, Recreation and Sport	
5111 Librarians	5111; 5211
5112 Conservators and curators	5112
5113 Archivists	5111; 5113; 5211
5121 Writers	5121; 5122; 5123; 5124
5122 Editors	5121; 5122; 5123; 5124
5123 Journalists	5121; 5122; 5123; 5124
5124 Professional occupations in public relations and communications	5121; 5122; 5123; 5124
5125 Translators, terminologists and interpreters	5125
5131 Producers, directors, choreographers and related occupations	5131
5132 Conductors, composers and arrangers	5132; 5133
5133 Musicians and singers	5133
5134 Dancers	5134
5135 Actors	5135; 5231
5136 Painters, sculptors and other visual artists	5136

NOC Occupations	Occupations to which potential for skills transferability exists
Technical – Art, Culture, Recreation & Sport	
5211 Library and archive technicians and assistants	5211
5221 Photographers	5221
5222 Film and video camera operators	5222
5223 Graphic arts technicians	5223
5224 Broadcast technicians	5224; 5225
5225 Audio and video recording technicians	5224, 5225
5226 Other technical occupations in motion pictures, broadcasting and the performing arts	5226; 5227
5227 Support and assisting occupations in motion pictures, broadcasting and the performing arts	5226; 5227
5231 Announcers and other broadcasters	5231
5241 Graphic designers and illustrating artists	5223; 5241
5242 Interior designers	5242
5245 Patternmakers - Textile, leather and fur products	5245
5254 Program leaders and instructors in recreation and sport	5254
Skilled – Sales & Service	
6231 Insurance agents and brokers	1233; 6231
6232 Real estate agents and salespersons	6232
6233 Retail and wholesale buyers	1225; 6233
6241 Chefs	6241; 6242
6242 Cooks	6242
6251 Butchers and meat cutters, retail and wholesale	6251
6252 Bakers	6252
6261 Police officers (except commissioned)	6261
6262 Fire-fighters	6262
6271 Hairstylists and barbers	6271
6272 Funeral directors and embalmers	6272
Skilled – Trades & Transport Operators	
7231 Machinists and machining and tooling inspectors	7231; 7316
7232 Tool and die makers	7232
7241 Electricians (except industrial and power system)	7241
7242 Industrial electricians	7242
7243 Power system electricians	7243
7244 Electrical power line and cable workers	7244
7245 Telecommunications line and cable workers	7245
7246 Telecommunications installation and repair workers	7246
7247 Cable television service and maintenance technicians	7247
7251 Plumbers	7251
7252 Steamfitters, pipefitters and sprinkler system installers	7252; 7316
7253 Gas fitters	7253
7261 Sheet metal workers	7261
7262 Boilermakers	7262; 7263
7263 Structural metal and platework fabricators and fitters	7263; 7262
7264 Ironworkers	7264
7266 Blacksmiths & Die setters	7266
7271 Carpenters	7271; 7293; 7295
7272 Cabinetmakers	7272
7281 Bricklayers	7281
7282 Cement finishers	7282
7283 Tilesetters	7283

NOC Occupations	Occupations to which potential for skills transferability exists
7284 Plasterers, drywall installers and finishers, and lathers	7284
7291 Roofers and shinglers	7291
7292 Glaziers	7292
7293 Insulators	7293
7294 Painters and decorators	7294
7295 Floor covering installers	7295
7311 Construction millwrights and industrial mechanics (except textile)	7311; 7316
7312 Heavy-duty equipment mechanics	7312; 7316
7313 Refrigeration and air conditioning mechanics	7313
7315 Aircraft mechanics and aircraft inspectors	7315; 7316
7316 Machine fitters	7316
7317 Textile machinery mechanics & repairers	7317
7318 Elevator constructors and mechanics	7318
7321 Motor vehicle mechanics, technicians and mechanical repairers	7316; 7321
7322 Motor vehicle body repairers	7322
7331 Oil and solid fuel heating mechanics	7331
7332 Electric appliance servicers and repairers	7332
7333 Electrical mechanics	7333
7334 Motorcycle and other related mechanics	7334
7335 Other small engine and equipment mechanics	7335
7341 Upholsterers	7341
7342 Tailors, dressmakers, furriers and milliners	7342
7343 Shoe repairers and Shoemakers	7343
7351 Stationary engineers and auxiliary equipment operators	7351
7352 Power systems and power station operators	7352
7371 Crane operators	7371
7372 Drillers & Blasters	7372
7373 Water Well Drillers	7373
7381 Printing Press Operators	7381
7382 Commercial divers	7382
Skilled – Primary Industries	
8241 Logging machinery operators	8241
8261 Fishing masters and officers	8261; 8262
8262 Fishing vessel skippers and fishermen/women	8262

Appendix V: Formal occupational barriers

Occupations	Requirements	Barrier
Business, Finance and Administration (NOC 11)		
1111 Financial Auditors and Accountants 1112 Financial and Investment Analysts 1113 Securities Agents, Investment Dealers and Traders	Certification & Association Membership	Partial Barrier
1233 Insurance Adjusters and Claims Examiners 1234 Insurance Underwriters	Licence and Specific Experience	
1121 Specialists in Human Resources 1221 Administrative Officers 1222 Executive Assistants 1223 Personnel and Recruitment Officers 1224 Property Administrators 1225 Purchasing Agents and Officers 1226 Conference and Event Planners 1231 Bookkeepers 1232 Loan officers 1241 Secretaries 1242 Legal Secretaries 1243 Legal Secretaries 1244 Court Reporters and Medical Transcriptionists	No regulation	No barrier
1227 Court Officers and Justices of the Peace	Specific Training, Experience	Absolute Barrier
1228 Immigration, Unemployment Insurance and Revenue Officers	Canadian Citizenship	
Natural and Applied Sciences (NOC21)		
2111 Physicists and Astronomers 2112 Chemists 2114 Meteorologists 2115 Other Professional Occupations in Physical Sciences 2121 Biologists and Related Scientists 2162 Computer Systems Analysts 2163 Computer Programmers 2252 Industrial Designers 2255 Mapping and Related Technologists and Technicians	None	No barrier
2244 Aircraft Instrument, Electrical and Avionics Mechanics, Technicians and Inspectors 2271 Air Pilots, Flight Engineers and Flying Instructors 2272 Air Traffic Controllers 2273 Deck Officers, Water Transport 2274 Engineer Officers, Water Transport 2275 Railway and Marine Traffic Controllers	Federal Licence	Absolute Barrier

Occupations	Requirements	Barrier
2113 Geologists, Geochemists and Geophysicists 2122 Forestry Professionals 2123 Agricultural Representatives, Consultants and Specialists 2131 – 2148 Engineers 2151 Architects 2152 Landscape Architects 2153 Urban and Land Use Planners 2154 Land Surveyors 2211 Applied Chemical Technologists and Technicians 2212 Geological and Mineral Technologists and Technicians 2221 Biological Technologists 2223 Forestry Technologists and Technicians 2230 Civil Engineering Technologists and Technicians 2232 Mechanical Engineering Technologists and technicians 2241 Electrical and Electronics Engineering Technologists and Technicians 2251 Architectural Technologists and Technicians 2253 Drafting Technologists and Technicians 2254 Survey Technologists and Technicians	Varied: Certification and Association Membership	Partial Barrier
2213 Meteorological Technicians 2222 Agricultural and Fish products Inspectors 2224 Conservation and Fishery Officers 2225 Landscape and Horticultural Technicians and Specialists 2234 Construction Estimators 2242 Electronic Service Technicians (Household and Business Equipment) 2243 Industrial Instrument Technicians and Mechanics 2261 Nondestructive Testers and Inspectors	Varied: Non entry; Experience; apprenticeship requirements	
Professional Occupations in Health (NOC 31)		
3111 Specialists Physicians 3112 Physicians and Surgeons 3113 Dentists 3114 Veterinarians 3121 Optometrists 3122 Chiropractors 3123 Other Professional Occupations in Health Diagnosing and Treating 3131 Pharmacists 3142 Physiotherapists 3143 Occupational Therapists 3151 Head Nurses and Supervisors 3152 Registered Nurses 3216 Medical Sonographers 3218 Electroencephalographic and other Diagnostic Technologies nec 3221 Denturists 3222 Dental Hygienists and Dental Therapists 3231 Opticians 3233 Registered Nursing Assistants	Certification and Association Membership	Absolute Barrier
3132 Dieticians and Nutritionists 3141 Audiologists and Speech Language Pathologists 3144 Other Professional Occupations in Therapy and Assessment 3211 Medical Laboratory Technologists and Pathologists' Assistants 3213 Animal Health Technologists 3214 Respiratory Therapists and Clinical Profusionists 3215 Medical Radiation Technologists 3217 Cardiology Technologists 3219 Other Medical Technologists and Technicians (Except Dental Health) 3220 Dental Technicians and Laboratory Bench Workers	Certification or Registration	Partial Barrier

Occupations	Requirements	Barrier
3231 Midwives and Practitioners of Natural Healing 3234 Ambulance Attendants and other Paramedical Occupations 3235 Other Technical Occupations in Therapy and Assessment		
3212 Medical Laboratory Technicians	None	No barrier
Social Science, Education, Government Services and Religion (NOC 41)		
4111 Judges	Extensive Experience	Absolute Barrier
4112 Lawyers and Quebec Notaries 4141 Secondary School Teachers 4142 Elementary School Teachers 4143 School and Guidance Counsellors 4151 Psychologists	Licence & Certification	
4160 Health and Social Policy Researchers, Consultants and Program Officers 4161 Natural and Applied Science Policy Researchers, Consultants and Program officers 4163 Economic Development Officers and Marketing Researchers and Consultants 4168 Program Officers Unique to Government	Specific Experience Canadian Citizenship	
4152 Social Workers 4155 Probation and Parole Officers and Related Occupations 4161 Natural and Applied Science Policy Researchers, Consultants and Program Officers 4211 Paralegal and related Occupations 4215 Instructors and Teachers of Disabled Persons	Varied: Certification & Association Membership	Partial Barrier
4121 University Professors 4131 College and Other Vocational Instructors	Mainly academic	No barrier
4153 Family, Marriage and Other related Counsellors 4154 Ministers of Religion 4162 Economists and Economic Policy Researchers and Analysts 4164 Social Policy Researchers, Consultants and Program Officers 4165 Health Policy Researchers, Consultants and Program Officers 4166 Education Policy Researchers, Consultants and Program Officers 4167 Recreation and Sports Program Supervisors and Consultants 4169 Other Occupations in Social Science (e.g. Anthropologists, Historians, Geographers, Linguists, Political Scientists) 4212 Community and Social Service Workers 4213 Employment Counsellors 4216 other Instructors 4217 Other Religious Occupations	Not regulated	
Art, Culture, Recreation and Sport (NOC 51)		
5111-5113 Librarians, Archivists, Conservators and Curators 5121-5125 Writing, Translating, and Public Relations Professionals 5131-5136 Creative and Performing Artists 5211-5212 Technical Occupations in Libraries, Museums and Galleries 5221-5227 Photographers, Graphic Arts technicians and Technical Occupations in Motion Pictures, Broadcasting and Performing Arts 5231-5232 Announcers and other Performers 5241 Graphic Designers and Illustrating Artists 5243 Theatre, Fashion, Exhibit and Other Creative Designers 5244 Artisans and Craftspersons 5245 Patternmakers – Textile, Leather and Fur Products 5251-5254 Athletes, Coaches, Referees and Related Occupations	None	No barrier
5242 Interior Designers	Association Membership	Partial barrier

Occupations	Requirements	Barrier
Sales and Service (NOC 62)		
6221 Technical Sales Specialists, Wholesale Trade 6231-6234 Insurance and Real Estate Sales, Occupations and Buyers 6251 Butcher and Meat Cutters, Retail and Wholesale 6261 Police Officers (Except Commissioned) 6262 Firefighters	None	No barrier
6241 Chefs and Cooks 6252 Bakers 6271 Hairstylists and Barbers 6272 Funeral Directors and Embalmers	Varied: Mainly Apprenticeship and Voluntary Certification	Partial Barrier
6211-6216 Sales and Service Supervisors	Extensive Specific Experience	Absolute Barrier
Trades and Skilled Transport and Equipment Operators (NOC 72-73)		
7247 Cable Television Service and Maintenance Technicians 7266 Blacksmiths and Die Setters 7341-7344 Upholsterers, Tailors, Shoe Repairers, Jewellers and Related Occupations 7372 Drillers and Blasters –Surface Mining, Quarrying and Construction 7373 Water Well Drillers 7382 Commercial Divers	None	No barrier
7241 Electricians (Except Industrial and Power System) 7251 Plumbers 7252 Steamfitters, Pipefitters and Sprinkle System Installers 7261 Sheet Metal Workers 7313 Refrigeration and Air Conditioning Mechanics 7315 Aircraft Mechanics and Aircraft Inspectors 7321 Motor Vehicle Mechanics, Technicians, and Mechanical Repairers 7361-7362 Train Crew Operating Occupations 7371 Crane Operators	Apprenticeship and Mandatory Certification	Absolute Barrier
7231 Machinists and Machining and Tooling Inspectors 7232 Tool and Die Maker 7242 Industrial Electricians 7243 Power System Electricians 7244 Electrical Power Line and Cable Workers 7245 Telecommunications Line and Cable Workers 7246 Telecommunications Installation and Repair Workers 7253 Gas Fitters 7262 Boilermakers 7263 Structural Metal and Platework Fabricators and Fitters 7264 Ironworkers 7265 Welders 7271-7272 Carpenters and Cabinetmakers 7281-7284 Masonry and Plastering Trades 7291 Roofers and Shinglers 7292 Glaziers 7293 Insulators 7294 Painters and Decorators 7295 Floor Covering Installers 7311 Construction Millwrights and Industrial Mechanics 7312 Heavy Duty Equipment Mechanics 7314 Railway Carmen/women 7316 Machine Fitters 7317 Textile Machinery Mechanics and Repairers 7318 Elevator Construction Mechanics 7322 Motor vehicle body repairers 7331-7335 Other Mechanics (e.g. Small Engines, Small Appliances) 7351-7352 Stationary Engineers & Power Station & System Oprs 7381 Printing Press Operators	Regulation is varied for all groups: Some Apprenticeship Voluntary Certification	Partial Barrier

Occupations	Requirements	Barrier
Primary Industry (NOC 82)		
8232 Oil and Gas Well Drillers, Servicers, Testers and Related Workers 8241 Logging Machinery Operators 8251-8257 Contractors, Operators and Supervisors in Agriculture, Horticulture and Aquaculture	Varied certification requirements - depending on occupation within the groups. Extensive experience required in some occupations	Partial Barrier
8261-8262 Fishing Vessel Masters and Skippers and Fishermen/women	Certification	Absolute Barrier
Processing, Manufacturing and Utilities (NOC 92)		
9211-9216 Supervisors, Processing Occupations 9221-9227 Supervisors, Assembly and Fabrication 9231-9234 Central Control and Process Operators in Manufacturing and Processing	None Not Entry Level: Experience is required in lower level jobs	Absolute Barrier

Appendix VI: Occupational barriers based on empirical analysis

NOC code	Occupation title	Most important field of study	Percentage of		Barrier
			Non-immigrants	Immigrants	
1111	Financial Auditors and Accountants	Accounting and auditing	27.1	18.7	1
1241	Secretaries (except Legal and Medical)	Secretarial science - General	26.4	19.7	1
2113	Geologists, Geochemists and Geophysicists	Geology, geological and earth sciences	27.2	23.3	1
2131	Civil Engineers	Civil engineering	44.9	20.8	0
2132	Mechanical Engineers	Mechanical Engineering - General	31.2	24.8	1
2133	Electrical and Electronics Engineers	Electrical/electronic engineering	38.8	23.7	0
2134	Chemical Engineers	Chemical engineering	33.0	23.2	1
2147	Computer Engineers	Computer engineering	30.2	26.4	1
2151	Architects	Architecture - General	41.1	27.5	0
2161	Mathematicians, Statisticians and Actuaries	Actuarial science	45.3	21.3	0
2162	Computer Systems Analysts	Computer science	31.7	23.4	1
2271	Air Pilots, Flight Engineers and Flying Instructors	Air Transportation technology	31.3	25.4	1
3112	General Practitioners and Family Physicians	General practice medicine	67.4	50.9	0
3113	Dentists	Dentistry or dental medicine	89.2	65.9	0
3114	Veterinarians	Veterinary medicine	77.8	44.4	0
3121	Optometrists	Optometry	88.6	59.5	0
3122	Chiropractors	Chiropractic technology	81.3	81.0	1
3131	Pharmacists	Pharmacy	87.8	72.8	0
3132	Dietitians and Nutritionists	Food nutrition, dietetics and dietary technology	27.5	15.7	0
3141	Audiologists and Speech-Language Pathologists	Audiology and speech pathology and therapy	70.4	60.6	1
3142	Physiotherapists	Physiotherapy	79.5	70.4	1
3143	Occupational Therapists	Occupational and physical therapy	55.2	57.6	1
3152	Registered Nurses	Nursing - General	75.3	59.1	0
3211	Medical Laboratory Technologists and Pathologists' Assistants	Medical laboratory technology	35.6	21.1	0
3214	Respiratory Therapists and Clinical Perfusionists	Respiratory technology	77.6	73.9	1
3215	Medical Radiation Technologists	Radiology	59.4	34.2	0
3215	Medical Radiation Technologists	Radiological technology	73.6	61.5	0
3215	Medical Radiation Technologists	X-ray - Medical	62.9	36.0	0

NOC code	Occupation title	Most important field of study	Percentage of		Barrier
			Non-immigrants	Immigrants	
		technology/radiography			
3215	Medical Radiation Technologists	X-ray - Radiotherapy/ nuclear medicine	85.5	65.4	0
3222	Dental Hygienists and Dental Therapists	Dental public health and hygiene	81.2	68.9	0
3231	Opticians	Medical equipment and prosthetics	47.0	37.2	1
3234	Ambulance Attendants and Other Paramedical Occupations	Emergency paramedical technology	45.2	39.2	1
4112	Lawyers and Quebec Notaries	Law and jurisprudence - General	57.6	40.5	0
4141	Secondary School Teachers	Secondary school teaching	72.4	62.5	1
4142	Elementary School and Kindergarten Teachers	Elementary school teaching - General	63.3	32.4	0
4152	Social Workers	Social work/welfare - General	36.0	31.9	1
4154	Ministers of Religion	Theology	34.0	38.8	1
5125	Translators, Terminologists and Interpreters	Translation and interpretation	35.2	26.4	1
5133	Musicians and Singers	Music, musicology	30.0	37.5	1
5134	Dancers	Dance	36.3	28.1	1
5241	Graphic Designers and Illustrating Artists	Graphic art and design	38.5	38.7	1
6261	Police Officers (except Commissioned)	Police and para-legal technologies	39.0	25.7	0
6262	Fire-fighters	Protection services	30.9	12.3	0
6271	Hairstylists and Barbers	Hairdressing	49.3	59.4	1
7231	Machinists and Machining and Tooling Inspectors	Machinist/machine shop	32.3	32.3	1
7232	Tool and Die Makers	Tool and die	45.9	40.3	1
7241	Electricians (except Industrial and Power System)	Construction electrician	37.6	17.4	0
7251	Plumbers	Plumbing and pipe trades	50.2	39.5	0
7261	Sheet Metal Workers	Sheet metal	38.9	27.5	0
7311	Construction Millwrights and Industrial Mechanics (except Textile)	Industrial engineering technology - General	38.6	33.5	1
7313	Refrigeration and Air Conditioning Mechanics	Air conditioning and refrigeration	34.7	18.0	0
7315	Aircraft Mechanics and Aircraft Inspectors	Aircraft and flight mechanics technology	42.3	29.3	0
7321	Motor Vehicle Mechanics, Technicians and Mechanical Repairers	Automobile mechanics technology	35.7	37.0	1

Note: 0 indicates an effective barrier; 1 indicates no effective barrier.

Appendix VII: Integration of formal and informal barriers

Occupation	Barrier			Comments
	Formal	*Informal*	*In Model*	
1111 Financial Auditors and Accountants	0.5	1	0.5	Mixed group: institutional barriers for some accountants; also for Auditors.
2113 Geologists, Geochemists and Geophysicists	0.5	1	0.5	Registration with a professional association required; but can work before accreditation.
2131 Civil Engineers	0.5	0	0.5	Work is possible without professional registration.
2132 Mechanical Engineers	0.5	1	0.5	Work is possible without professional registration.
2133 Electrical and Electronics Engineers	0.5	0	0.5	Work is possible without professional registration.
2134 Chemical Engineers	0.5	1	0.5	Work is possible without professional registration.
2147 Computer Engineers	0.5	1	0.5	Work is possible without professional registration.
2151 Architects	0.5	0	0.5	Registration with an association is required but work is possible without.
2161 Mathematicians, Statisticians and Actuaries	0.5	0	0.5	Mixed group: accreditation requirements only for Actuaries.
2271 Air Pilots, Flight Engineers and Flying Instructors	0	1	0.5	Federal licence required; but work may be possible for certain types of planes if shortage exists.
3122 Chiropractors	0	1	0	Examinations of the Canadian Chiropractic Examining Board; provincial licence required.
3132 Dietitians and Nutritionists	0.5	0	0	Registration with professional association required.
3141 Audiologists and Speech Language Pathologists	0.5	1	0.5	Registration with professional association required in some but not in all jurisdictions.
3142 Physiotherapists	0	1	0	Registration with regulatory boards required.
3143 Occupational Therapists	0	1	0	National certification examination; licensing required.
3211 Medical Laboratory Technologists and Pathologists Assistants	0.5	0	0.5	Mixed group.
3214 Respiratory Therapists and Clinical Perfusionists	0.5	1	0.5	Licensing required in some jurisdictions.
3215 Medical Radiation Technologists	0.5	0	0	Registration with professional body required.
3231 Opticians	0	1	0.5	Licensing required in most jurisdictions.
3234 Ambulance Attendants and other paramedical occupations	0.5	1	0.5	Certification required.
4141 Secondary School Teachers	0	1	0	Highly regulated.
4152 Social Workers	0.5	1	0.5	Some regulation.

Occupation	Barrier			Comments
	Formal	*Informal*	*In Model*	
6261 Police Officers (except Commissioned)	1	0	0	No certification or licence requirements; but requirement for specific (local) knowledge and experience.
6262 Fire Fighters	1	0	0	No certification or licence requirements; but requirement for specific (local) knowledge and experience.
6271 Hairstylists and Barbers	0.5	1	0.5	Requirements range from trade certification to licensing by a provincial association.
7231 Machinists and Machining and Tooling Inspectors	0.5	1	0.5	Certification not compulsory in all jurisdictions except Quebec.
7232 Tool and Die Makers	0.5	1	0.5	Certification not compulsory in all provinces.
7321 Motor Vehicle Mechanics and Technicians	0	1	0.5	Mixed group.

Appendix VIII: Values for indices of wages, job prospects and employment used in the Model

NOC Occupation (4-digit)	Wages	Job prospects	Employment
1111 Financial auditors and accountants	0.34	0.67	0.211
1112 Financial and investment analysts	0.44	1.00	0.034
1113 Securities agents, investment dealers and traders	0.54	1.00	0.035
1121 Specialists in human resources	0.39	0.67	0.049
1122 Professional occupations in business services to management	0.37	1.00	0.063
1221 Administrative officers	0.28	1.00	0.183
1222 Executive assistants	0.28	1.00	0.021
1223 Personnel and recruitment officers	0.29	1.00	0.024
1225 Purchasing agents and officers	0.32	1.00	0.034
1226 Conference and event planners	0.21	1.00	0.014
1228 Immigration, unemployment insurance and revenue officers	0.28	1.00	0.035
1231 Bookkeepers	0.16	0.67	0.183
1232 Loan officers	0.27	1.00	0.044
1233 Insurance adjusters and claims examiners	0.30	1.00	0.034
1234 Insurance underwriters	0.28	1.00	0.020
1241 Secretaries (except legal and medical)	0.18	0.33	0.571
1242 Legal secretaries	0.21	0.33	0.065
1243 Medical secretaries	0.17	0.33	0.078
2111 Physicists and astronomers	0.42	0.33	0.006
2112 Chemists	0.35	0.33	0.021
2113 Geologists, geochemists and geophysicists	0.45	0.33	0.013
2114 Meteorologists	0.41	0.33	0.002
2121 Biologists and related scientists	0.30	0.67	0.019
2122 Forestry professionals	0.38	0.67	0.008
2123 Agricultural representatives, consultants and specialists	0.32	0.67	0.007
2131 Civil engineers	0.38	1.00	0.058
2132 Mechanical engineers	0.39	1.00	0.047
2133 Electrical and electronics engineers	0.42	1.00	0.058
2134 Chemical engineers	0.42	1.00	0.015
2141 Industrial and manufacturing engineers	0.39	0.67	0.017
2142 Metallurgical and materials engineers	0.43	0.67	0.003
2143 Mining engineers	0.44	0.67	0.005
2144 Geological engineers	0.41	0.67	0.003
2145 Petroleum engineers	0.55	0.67	0.007
2146 Aerospace engineers	0.44	0.67	0.007
2147 Computer engineers	0.38	0.67	0.029

NOC Occupation (4-digit)	Wages	Job prospects	Employment
2151 Architects	0.33	1.00	0.017
2152 Landscape architects	0.24	1.00	0.003
2153 Urban and land use planners	0.38	1.00	0.011
2154 Land surveyors	0.28	1.00	0.014
2161 Mathematicians, statisticians and actuaries	0.42	1.00	0.010
2162 Computer systems analysts	0.37	1.00	0.161
2163 Computer programmers	0.30	0.67	0.124
2211 Applied chemical technologists and technicians	0.27	0.67	0.039
2212 Geological and mineral technologists and technicians	0.30	0.67	0.016
2213 Meteorological technicians	0.31	0.67	0.002
2221 Biological technologists and technicians	0.21	0.33	0.018
2223 Forestry technologists and technicians	0.25	0.33	0.019
2224 Conservation and fishery officers	0.23	0.33	0.013
2230 Civil engineering technologists and technicians and construction estimators	0.31	0.67	0.038
2232 Mechanical engineering technologists and technicians	0.33	0.67	0.018
2233 Industrial engineering and manufacturing technologists and technicians	0.32	0.67	0.014
2241 Electrical and electronics engineering technologists and technicians	0.31	1.00	0.065
2242 Electronic service technicians (household and business equipment)	0.24	1.00	0.104
2243 Industrial instrument technicians and mechanics	0.38	1.00	0.015
2244 Aircraft instrument, electrical and avionics mechanics, technicians and inspectors	0.35	1.00	0.013
2251 Architectural technologists and technicians	0.25	0.33	0.008
2252 Industrial designers	0.31	0.33	0.009
2253 Drafting technologists and technicians	0.27	0.67	0.058
2254 Survey technologists and technicians	0.21	0.33	0.007
2264 Construction inspectors	0.30	0.67	0.017
2271 Air pilots, flight engineers and flying instructors	0.49	1.00	0.020
2272 Air traffic control occupations	0.44	1.00	0.008
2273 Deck officers, water transport	0.40	1.00	0.009
2274 Engineer officers, water transport	0.38	1.00	0.004
3111 Specialist physicians	0.95	1.00	0.038
3112 General practitioners and family physicians	0.81	1.00	0.066
3113 Dentists	0.77	1.00	0.028
3114 Veterinarians	0.41	1.00	0.011
3121 Optometrists	0.48	1.00	0.006
3122 Chiropractors	0.50	1.00	0.006
3131 Pharmacists	0.37	1.00	0.037
3132 Dietitians and nutritionists	0.24	1.00	0.012
3141 Audiologists and speech-language pathologists	0.31	0.67	0.008
3142 Physiotherapists	0.30	1.00	0.023
3143 Occupational therapists	0.28	0.67	0.011
3151 Head nurses and supervisors	0.33	1.00	0.026

NOC Occupation (4-digit)	Wages	Job prospects	Employment
3152 Registered nurses	0.27	1.00	0.415
3211 Medical laboratory technologists and pathologists' assistants	0.28	1.00	0.033
3212 Medical laboratory technicians	0.23	0.67	0.038
3213 Animal health technologists	0.16	1.00	0.008
3214 Respiratory therapists and clinical perfusionists	0.34	1.00	0.009
3215 Medical radiation technologists	0.30	1.00	0.024
3216 Medical sonographers	0.34	1.00	0.003
3217 Cardiology Technologies	0.23	1.00	0.003
3218 Electroencephalographic and other diagnostic technologists n.e.c.	0.25	1.00	0.003
3221 Denturists	0.29	1.00	0.003
3222 Dental hygienists and dental therapists	0.27	1.00	0.020
3231 Opticians	0.22	0.67	0.008
3233 Registered nursing assistants	0.15	0.67	0.005
3234 Ambulance attendants and other paramedical occupations	0.27	0.67	0.025
4112 Lawyers and Quebec notaries	0.61	1.00	0.102
4141 Secondary school teachers	0.34	0.67	0.283
4142 Elementary school and kindergarten teachers	0.31	0.67	0.415
4143 School and guidance counsellors	0.34	1.00	0.021
4151 Psychologists	0.33	1.00	0.025
4152 Social workers	0.27	0.67	0.068
4153 Family, marriage and other related counsellors	0.21	0.67	0.054
4155 Probation and parole officers and related occupations	0.32	0.67	0.008
4162 Economists and economic policy researchers and analysts	0.42	0.67	0.012
4163 Economic development officers and marketing researchers and consultants	0.33	0.67	0.047
4166 Education policy researchers, consultants and program officers	0.33	0.67	0.024
4167 Recreation and sports program supervisors and consultants	0.17	0.67	0.021
4168 Program officers unique to government	0.34	0.67	0.006
4212 Community and social service workers	0.19	0.67	0.092
4213 Employment counsellors	0.24	0.67	0.021
4215 Instructors and teachers of disabled persons	0.23	0.67	0.034
5111 Librarians	0.25	0.67	0.022
5112 Conservators and curators	0.27	0.67	0.003
5113 Archivists	0.24	0.67	0.003
5121 Writers	0.23	1.00	0.031
5122 Editors	0.27	0.67	0.014
5123 Journalists	0.27	0.67	0.022
5124 Professional occupations in public relations and communications	0.27	0.67	0.048
5125 Translators, terminologists and interpreters	0.23	0.67	0.020
5131 Producers, directors, choreographers and related occupations	0.30	0.67	0.028
5132 Conductors, composers and arrangers	0.23	0.67	0.003

NOC Occupation (4-digit)	Wages	Job prospects	Employment
5133 Musicians and singers	0.10	0.67	0.051
5134 Dancers	0.10	0.67	0.010
5135 Actors	0.14	0.67	0.013
5136 Painters, sculptors and other visual artists	0.11	0.67	0.022
5211 Library and archive technicians and assistants	0.17	0.67	0.026
5221 Photographers	0.16	0.67	0.020
5222 Film and video camera operators	0.26	0.67	0.006
5223 Graphic arts technicians	0.19	0.67	0.012
5224 Broadcast technicians	0.29	0.67	0.006
5225 Audio and video recording technicians	0.22	0.67	0.013
5226 Other technical occupations in motion pictures, broadcasting and the performing arts	0.23	0.67	0.014
5227 Support and assisting occupations in motion pictures, broadcasting and the performing arts	0.21	0.67	0.009
5231 Announcers and other broadcasters	0.21	0.67	0.015
5241 Graphic designers and illustrating artists	0.21	1.00	0.061
5242 Interior designers	0.20	0.67	0.014
5245 Patternmakers - Textile, leather and fur products	0.18	0.67	0.003
5254 Program leaders and instructors in recreation and sport	0.07	0.67	0.127
6231 Insurance agents and brokers	0.29	1.00	0.098
6232 Real estate agents and salespersons	0.29	1.00	0.098
6233 Retail and wholesale buyers	0.26	1.00	0.040
6241 Chefs	0.18	0.33	0.039
6242 Cooks	0.10	0.33	0.349
6251 Butchers and meat cutters, retail and wholesale	0.17	0.33	0.046
6252 Bakers	0.13	0.33	0.069
6261 Police officers (except commissioned)	0.42	1.00	0.101
6262 Fire-fighters	0.40	1.00	0.040
6271 Hairstylists and barbers	0.12	0.67	0.144
6272 Funeral directors and embalmers	0.28	0.67	0.007
7231 Machinists and machining and tooling inspectors	0.28	1.00	0.079
7232 Tool and die makers	0.34	0.33	0.027
7241 Electricians (except industrial and power system)	0.25	0.67	0.081
7242 Industrial electricians	0.36	0.33	0.050
7243 Power system electricians	0.40	0.33	0.008
7244 Electrical power line and cable workers	0.38	0.33	0.020
7245 Telecommunications line and cable workers	0.33	0.33	0.013
7246 Telecommunications installation and repair workers	0.35	0.33	0.042
7247 Cable television service and maintenance technicians	0.29	0.67	0.007
7251 Plumbers	0.23	0.67	0.049
7252 Steamfitters, pipefitters and sprinkler system installers	0.31	0.67	0.030
7253 Gas fitters	0.29	0.33	0.008
7261 Sheet metal workers	0.25	0.33	0.025
7262 Boilermakers	0.29	0.33	0.006

NOC Occupation (4-digit)	Wages	Job prospects	Employment
7263 Structural metal and platework fabricators and fitters	0.27	0.33	0.013
7264 Ironworkers	0.26	0.33	0.013
7266 Blacksmiths & Die setters	0.26	0.33	0.002
7271 Carpenters	0.17	0.67	0.200
7272 Cabinetmakers	0.16	0.33	0.030
7281 Bricklayers	0.18	0.33	0.024
7282 Cement finishers	0.19	0.33	0.014
7283 Tilesetters	0.18	0.33	0.008
7284 Plasterers, drywall installers and finishers, and lathers	0.16	0.67	0.035
7291 Roofers and shinglers	0.15	0.67	0.027
7292 Glaziers	0.19	0.67	0.012
7293 Insulators	0.21	0.67	0.010
7294 Painters and decorators	0.13	0.67	0.068
7295 Floor covering installers	0.17	0.67	0.022
7311 Construction millwrights and industrial mechanics (except textile)	0.36	0.67	0.110
7312 Heavy-duty equipment mechanics	0.30	0.67	0.069
7313 Refrigeration and air conditioning mechanics	0.27	1.00	0.023
7315 Aircraft mechanics and aircraft inspectors	0.32	0.67	0.025
7316 Machine fitters	0.28	1.00	0.010
7317 Textile machinery mechanics & repairers	0.23	0.67	0.004
7318 Elevator constructors and mechanics	0.41	0.67	0.005
7321 Motor vehicle mechanics, technicians and mechanical repairers	0.23	0.67	0.223
7322 Motor vehicle body repairers	0.20	0.67	0.061
7331 Oil and solid fuel heating mechanics	0.20	0.67	0.007
7332 Electric appliance servicers and repairers	0.19	0.67	0.015
7333 Electrical mechanics	0.29	0.67	0.012
7334 Motorcycle and other related mechanics	0.16	0.67	0.003
7335 Other small engine and equipment mechanics	0.18	0.67	0.011
7341 Upholsterers	0.16	0.33	0.012
7342 Tailors, dressmakers, furriers and milliners	0.11	0.33	0.042
7343 Shoe repairers and Shoemakers	0.14	0.33	0.005
7351 Stationary engineers and auxiliary equipment operators	0.34	1.00	0.032
7352 Power systems and power station operators	0.47	1.00	0.011
7371 Crane operators	0.33	0.33	0.020
7372 Drillers & Blasters	0.28	0.33	0.005
7373 Water Well Drillers	0.21	0.33	0.002
7381 Printing Press Operators	0.26	0.33	0.041
7382 Commercial divers	0.22	0.33	0.002
8241 Logging machinery operators	0.26	0.33	0.025
8261 Fishing masters and officers	0.33	0.33	0.004
8262 Fishing vessel skippers and fishermen/women	0.18	0.33	0.052